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Collective Reviews

INTRATHORACIC SURGERY (LUNGS, HEART, AND GREAT VESSELS: SURGICAL MANAGEMENT OF DISEASES OF THE ESOPHAGUS), 1905-1955.

BRIAN BLADES, M.D., F.A.C.S., Washington, D. C.

COMPREHENSION of the progress of intrathoracic surgery during the past 50 years is difficult. Probably only those who pioneered in the field can really appreciate the accomplishments of the past half century.

The now middle-aged group of surgeons who profited by the courage, mistakes, and contributions of their elders remember well the discouragingly high mortality and morbidity associated with all intrathoracic operations only a few years ago.

Adequate recording and fair credit assignment of contributions in the field is at present an insurmountable task. Progress has been amazingly rapid, too many have contributed, and even now the infallible test of time cannot be applied to many recent developments.

Continuity would be improved by a separate description of each phase of intrathoracic surgery. This, however, would not furnish a true account since each technique and each advance depended upon gradual developments in successful surgical treatment of various diseased intrathoracic organs.

From the Department of Surgery. The George Washington University School of Medicine, Washington, D. C.

There have been very few really new technical features introduced in intrathoracic surgery in the past half century. Surgeons were forced to wait until anesthetic techniques, a general appreciation of the physiology of respiration, fluid replacement, blood transfusions, and finally chemotherapy made it possible for them to perform necessary operations with relative safety. For example, the removal of lung tissue was extremely hazardous until these nontechnical features were developed. It might be safe to compare the status of intracardiac surgery today with that of pulmonary lobectomy 25 or 30 years ago. The general use of a satisfactory and simple extracorporeal pump may make current cardiac operations as obsolete as the earlier surgical approaches to the lungs.

Historians are fair game for indignant descendents for sins of omission or commission after a lapse of a century or more. Consider, then, the difficulties of a chronicle of the most dramatic and modern developments in the field of surgery, with many of the heroes still alive and active.

Fifty years ago and for the following 3 decades, the contents of the thoracic cavity had no special attraction for surgeons. Chest operations were

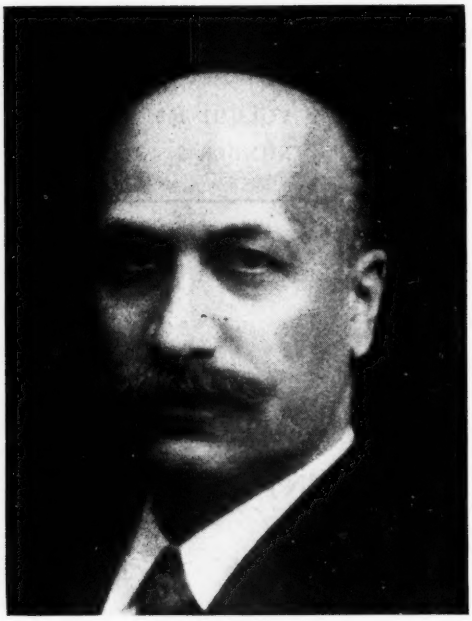

FIG. 1. Willy Meyer, founder of the American Association for Thoracic Surgery. A pioneer in the field until his death in 1932.

confined chiefly to drainage of empyemas and operations upon the chest wall.

Two textbooks on chest surgery, in the English language, were available: Stephen Paget's "Surgery of the Chest" published in 1896, and Carl Beck's "Surgical Diseases of the Chest," in 1907. Paget's pessimism was evident: "There are signs that we have reached the stage in this position of our art beyond which on our present lines we cannot advance much further." Of cardiac surgery he wrote: "Surgery of the heart has probably reached the limits set by nature to all surgery. No new methods and no new discovery can overcome the natural difficulties that attend a wound of the heart."

The suture of a cardiac wound by Rehn, the same year of Paget's gloomy prediction, and earlier resections of the apex of the tuberculous lung by Tuffier in 1891 and Lawson in 1893 were indications of things to come, but at that time could only be considered daring and lucky operations not likely to be successful in many instances.

It has been correctly stated that modern thoracic surgery had its beginnings during World War I. This is true since the large number of chest wounds forced surgeons to operate in the open thorax, and on return to civilian life their interests were directed to other phases of thoracic surgery.

It would be a grave mistake, however, to consider the first 20 years of the twentieth century a void in the development of chest surgery. The most pressing problem was the control of pneumothorax in operations in the open chest. Attempts to build pressurized cabinets to overcome these difficulties were made principally by Sauerbruch, with his negative pressure cabinet, and Willy Meyer with a positive-negative pressure apparatus (Fig. 1). In 1903, Sauerbruch first published observations on the negative pressure cabinet.

Some conception of the mechanical and physical difficulties, when the cabinet was finally used on human beings, becomes apparent when one realizes that Sauerbruch's apparatus weighed 10,000 pounds. Moreover, it was necessary for the bodies of both the patient and the operating team to be within the confines of the chamber, with their heads outside. It is interesting to review early results of operations performed within this apparatus.

Other investigators of the early twentieth century were studying methods for delivering an anesthetic agent by positive pressure methods. Prominent among these were Rudolph Matas of New Orleans, Samuel Robinson and Northrup, Fells and O'Dyer. It was not until 1909, however, that a simple practical method for the control of intrapleural and intrapulmonic pressures was introduced by Meltzer and Auer. Their technique was employed clinically by Elsberg, who added the important refinement of placing the endotracheal tube into the trachea through a laryngoscope under direct vision.

It is of interest that before and after Meltzer and Auer's contribution, positive pressure endo-

TABLE I.

	Operation	*Cases*	*Deaths*
Lung	Gangrene	4	2
	Abscess	3	1
	Bronchial fistula	1	0
Chest wall	Extension of breast carcinoma	2	0
	Osteosarcoma	1	1
Heart	Suture	1	1
Esophagus	Carcinoma, inoperable	5	5
		17	10

Mortality, 59 per cent. Surgeons: Mikulicz, Sauerbruch, Garre

tracheal anesthesia was not accepted with general enthusiasm. Dudley Tate, in 1907, in a paper discussing both positive and negative pressure methods, listed the following objections to positive pressure anesthesia: "It reverses the normal respiratory rhythm. Sudden distention of the lung causes interstitial emphysema and subpleural hemorrhages. Repeated pulmonary inflation causes dilatation of the right heart and body temperature is markedly lowered by excessive evaporation."

As late as 1918 the skepticism persisted, and Bevan, one of the leading surgeons of that period, considered the method dangerous and concluded "Endotracheal anesthesia has little place in practical surgery." Moreover, war experiences with healthy young men with open chest wounds caused the amateur chest surgeons to conclude protection from temporary open pneumothorax might be unnecessary. History has a strange way of repeating itself.

A satisfactory method for the administration of anesthetic gases and oxygen was available, but its fullest application required an appreciation of the physiologic principles involved in open pneumothorax. These were clearly defined by Graham and Bell in connection with their work on the Empyema Commission.

It is difficult to evaluate the impact of the findings of the Empyema Commission in World War I on the entire scope of thoracic surgery after more than a quarter of a century. The original Commission consisted of Edward K. Dunham, a bacteriologist, and Evarts A. Graham, a young surgeon (Fig. 2). Eventually the Commission had 22 members.

In the early days of World War I, the mortality from operations on cases of empyema at Camp Lee, Virginia, was roughly 40 per cent. After the acceptance of the Empyema Commission's recommendations the mortality dropped to 4.3 per cent. The most important factor in the high mortality was the drainage of an empyema before the mediastinum was stabilized and the production of an open pneumothorax. In a patient already burdened with pneumonia and a decreased vital capacity, further respiratory embarrassment often resulted in death. After a true localized abscess was formed in the postpneumonic phase, the mortality figures from drainage dropped tremendously.

It should be remembered that at this time x-rays of the chest were available, but they were

FIG. 2. Captain (later Major) Evarts A. Graham, of the Empyema Commission, World War I.

hardly reliable. Although Carl Beck had pleaded for more liberal use of roentgen examinations in 1907, techniques were crude. The modern Coolidge tube was not invented until 1917. Precise localization of intrathoracic disease was difficult. Moreover, the problems of treating enormous numbers of cases of empyema had never before been experienced in the history of the world.

During this period the use of Dakin's solution was hailed with enthusiasm, comparable to the use of penicillin. The ability of the solution to dissolve thick, inspissated pus in cases of chronic empyemas was at that time tremendously important.

Fortunately there were many who doubted the importance of the factor of open pneumothorax which the original Commission had emphasized. As a consequence, Bell and Graham were detached from the Commission and sent to the Johns Hopkins Medical School to perform experimental studies on the problem. Their findings were of prime importance and now well known. Probably the most important single observation was that the establishment of an open pneumothorax on one side exerts a deleterious effect on both lungs, not to the same degree but

depending largely on the fixation of the mediastinum. The mediastinal partition is not constant in its fixation and, therefore, cannot be considered an effectual barrier in the presence of an open pneumothorax on either side. Furthermore, the ability of any given individual to withstand an opening in the chest depends largely upon his vital capacity.

It is of particular interest that the study of a disease which is now so rare led to the establishment of many basic physiologic principles which have influenced all advances in thoracic surgery.

During the early 1900's, Carrel and Watts were laying the groundwork for blood vessel anastomosis, which was to become practical many years later; and Matas, Halsted, and others were pioneering in the field of surgery of aneurysms. As early as 1908, Carrel preserved a segment of a dog's aorta for a period of 30 days and successfully reimplanted it into the aorta of another dog.

Instances of successful cardiac surgery were few and far between. In 1913, Rehn and Sauerbruch performed operations for constrictive pericarditis, and initial attempts in the treatment of valvular stenosis were carried out by Doyan (1913) and Tuffier (1914). Preceding these ventures in cardiac surgery, as early as 1902, Brauer recommended the removal of part of the anterior chest wall for what he termed mediastinopericarditis. The decompression of large hearts was recommended and performed by Morison in 1907.

Esophageal surgery was directed to attempts to relieve obstruction. Early attempts at esophagogastrostomy were uniformly fatal. In 1907, Wendell performed the operation and employed a Murphy button in the anastomosis. The patient died 24 hours later from hemorrhage. Transpleural resection of the esophagus was attempted by Willy Meyer in 1912. All of his patients died.

Of historical interest is a portion of an operative note from Herman Fisher's paper entitled, "Transthoracic Cardiotomy, A New Method for the Cure of the Classical Benign Stricture of the Esophagus." "The patient was anesthetized by Meltzer-Orr continued insufflation of the lung technique. The thorax was opened at the seventh intercostal space. It was found that the original incision was too high. The second incision was made in the eighth intercostal space. The lung was pushed upward and held out of the way by Japanese silk handkerchiefs sterilized with vaseline. The diaphragm was incised and the stomach was pulled through the thoracic cavity. A transverse incision was made between two silk sutures into the cardia. The stricture was entered and a catheter placed in it which was then withdrawn through a gastrostomy opening. The incision in the cardia was closed and the stomach was replaced in the abdomen. Unfortunately the operation terminated fatally."

Achalasia was most often treated by dilatation. Other techniques were described, including the removal of ribbonlike strips of the esophagus by Jaffé in 1907, and digital dilatation by the way of a gastrostomy and esophagogastrostomy. Heller described his operation for achalasia in 1913, but only within recent years has it received proper attention.

The first successful case of resection of the thoracic portion of the esophagus for carcinoma was performed by Franz Torek in 1913. The patient was a 50 year old woman with a carcinoma just below the arch of the aorta, extending for 1.75 inches. The operation was performed through the seventh interspace, the esophagus resected, the lower end of the esophagus doubly ligated and invaginated, and the upper portion of the organ brought out in the neck and through a chest skin tube down to the middle of the second intercostal space.

After the eighth postoperative day, the cervical esophagostomy tube was connected to a gastrostomy tube. The patient survived 11 years. Torek's triumph was not repeated for 11 years, when Carl Eggers reported the second successful case with the Torek technique (Fig. 3).

In the early 1900's most patients with tuberculosis were treated by bed rest and sanatorium care. Pneumothorax was gradually being adopted, but other methods of collapse therapy were employed as a last resort. The first thoracoplastic operation was undertaken as early as 1885 by de Cerendille of Lausanne, but it was not until 1911 that a thoracoplasty was performed in the United States by Robert G. LeCont at the Pennsylvania Hospital in Philadelphia.

Stuertz, in 1911, advocated paralysis of one phrenic nerve to relax the diseased lung, and in 1914 Friedrich suggested temporary paralysis by crushing the nerve.

Earlier tragedies associated with efforts to resect diseased portions of tuberculous lungs had completely discredited this approach. Tuber-

culous empyema was common and the literature from 1910 until the early 1930's contained many articles concerning the subject.

During the years 1910 to 1920, although there were increasing numbers of surgeons interested in the possibilities of surgical intervention in the chest, there was really no dramatic progress except for specific examples which have been mentioned. The literature was devoted mostly to the treatment of empyema, lung abscess, and occasionally the esophagus. There was some increased interest in the operation of thoracoplasty for tuberculosis. However, the resistance of medical phthisiologists precluded widespread use of any major surgical operation.

Pyogenic empyema was a major problem. Wilensky and others wrote extensively on this subject. It is striking that in one of his articles he reports 299 cases of acute empyema admitted to the Mt. Sinai Hospital during a 10 year period ending in 1913. The mortality rate at that time was 28 per cent. The highest mortality occurred in infants. Of the entire series of cases only 6 were tuberculous, the others being caused by pneumonia. Pneumococcal empyemas were most numerous, with streptococcal lesions second. The same author in 1915 reviewed his experiences with 82 cases of chronic empyema. These figures seem incredible when one realizes that today, even in the leading University Hospitals, it is possible for a resident to complete his entire training and not see a case of acute or chronic empyema.

In 1910, the first meeting of the Clinical Congress of the American College of Surgeons was held in Chicago. Albert J. Ochsner was the President of this organization. An extensive 5 day program of operative clinics included 1 case of sarcoma of the rib and 1 case of wiring of an aneurysm of the descending arch of the aorta with a bronze aluminum wire and electrolysis. There were no other instances of chest wall or intrathoracic operations.

Eight years later Meltzer in his Presidential Address at the first meeting of the American Association for Thoracic Surgery noted that in looking over the program of the coming meeting of the American Medical Association he found papers on abdominal surgery sufficient to crowd the programs of two surgical sections, but that there was not a single paper on thoracic surgery.

The lack of interest in chest surgery during this era is not surprising to anyone who has been

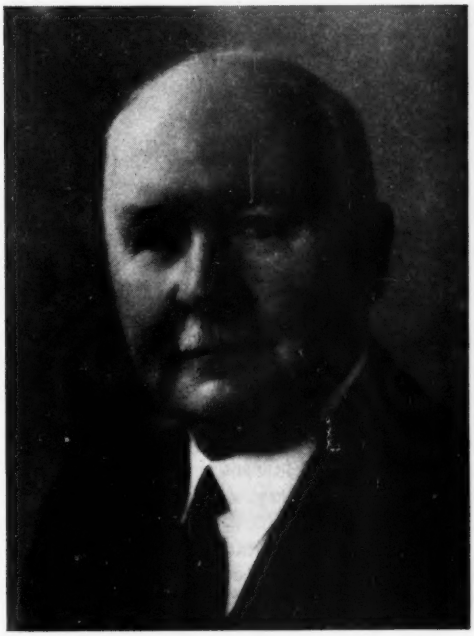

FIG. 3. Carl Eggers, Chairman of the Eggers Committee to establish the Board of Thoracic Surgery. Pioneer in all phases of thoracic surgery.

repeatedly exposed to the stench of a putrid empyema or to the malnourished, desperately ill patient ready to surrender his body to death after all conservative measures have failed. For the next 2 decades only the dedicated and very brave were willing to jeopardize their surgical practice with shocking mortality rates, and to give their time and energies without regard of financial return and with only a guaranteed high incidence of bitter disappointment.

On June 7, 1917, Willy Meyer of New York invited a small group of men to discuss the founding of an organization for the advancement of thoracic surgery. And in 1918 the first meeting of the American Association for Thoracic Surgery was held in Chicago. S. J. Meltzer, a physiologist, was President. In the presidential address he discussed his method for the administration of endotracheal anesthesia and it was obvious he deeply resented criticism of his technique. He emphasized that endotracheal insufflation furnished his patients with "luxurious artificial respiration." A revealing statement was included: "When the individual receives sufficient arti-

FIG. 4. From left to right, Claude Beck, Leo Eloesser and Dan Elkin on Eloesser's cutter, The Flirt. The picture was taken on a cruise following the 1931 meeting of the American Association for Thoracic Surgery. Eloesser's description: "I'm at the tiller in my Admiral's uniform looking at the pennant to see the way the wind blows."

ficial respiration simultaneously with ether anesthesia, the heart may be handled with practical impunity. It is different when the respiration is insufficient, the heart often responds to each touch with a series of irregular beats which in some hearts may lead to ventricular fibrillation and death." All modern students of what we now call cardiac arrest might conserve time, printers ink, and paper after a perusal of Meltzer's presidential address.

There were 50 original members of the American Association for Thoracic Surgery, all of whom are dead, I believe, except Rudolph Matas of New Orleans. There are now 12 honorary members, 54 senior members, 202 active members, and 182 associate members. If the Founders Group could attend next year's meeting of the American Association for Thoracic Surgery in Atlantic City, they would probably have about the same reaction of amazement Stephen Paget might experience if he could see a surgeon with his finger in the patient's heart.

During the years 1920 to 1940, trying but steady development occurred in all phases of chest surgery. Tremendous improvements in anesthetic techniques and gradual understanding of shock, fluid replacement, and, belatedly, the extensive use of blood transfusions count for much of the progress.

In the roaring twenties the pioneering giants of thoracic surgery made their entrances on the surgical stage (Fig. 4). Some have been mentioned in connection with specific contributions. The papers and discussions of Archibald, Berry, Corylls, Eloesser, Harrington, Heuer, Lambert, O'Brien, Shenstone, and many others furnish wonderful reading even concerning problems which are now settled. Many of the most important articles were carried in Archives of Surgery, after 1922, in the section devoted to the activities of the American Association for Thoracic Surgery. Fourteen years later the Journal of Thoracic Surgery was founded.

Energies were directed largely toward treatment of suppurative disease of the lungs, both bronchiectasis and lung abscess, and improvements in the surgical treatment of tuberculosis. The current indications for operation on the lungs in 1921 were summarized by Lloyd as follows: "For tuberculosis, if a collapse of the cavity is possible by pneumothorax it is preferable; if not, extrapleural thoracoplasty should be performed in one or several stages. For bronchiectasis, extrapleural thoracoplasty may be performed as advocated by Hedblom, although excision and drainage or lobectomy offers a better chance of a radical cure. Foreign bodies should be removed through the bronchoscope; if impossible, thoracotomy with direct removal may be necessary. For lung abscesses, the best results may be obtained by thoracotomy and drainage. Tumors of the chest wall, including ribs and pleura, should be treated by complete removal and the use of pedunculated skin grafts from the abdomen if the defect is too large." For tumors of the lung, the author advocated thoracotomy and direct excision by partial or complete lobectomy. He stated that these measures offer the only chance of cure. For empyema, early and frequent aspirations followed, if necessary, by intercostal drainage are indicated. A review of this article after 33 years makes it clear that the author could do some of the things he advocated, the others he hoped he might one day be able to do safely.

An important and revealing article was presented by Lilienthal in 1922, concerning resection of the lung for suppurative infections with a report based on 31 operative cases in which resection of the lung tissue was done or intended. In this series, 31 patients were operated upon with a mortality, in cases of single lobe involvement, of 42 per cent. In 10 cases, in which the disease was not limited to a single lobe, the mortality was 70 per cent. Lilienthal considered

patients with bilateral disease as not being suitable subjects for excision of lung tissue. The author described both the two stage procedure, with rubbing of the pleura with gauze and the lobe surrounded by a single layer of iodoform gauze, and the technique for the one stage operation. His description of the water-sealed drain is adequate for today's use. Another significant statement was that blood transfusions usually were necessary.

The shocking mortality of Lilienthal's early experience with lobectomy for suppurative diseases stimulated efforts of others to find a safer and effectual substitute for lobectomy.

In 1923, Graham described his operation "pneumonectomy with cautery." He operated upon 3 patients and considered all 3 greatly benefited. He pointed out that anesthesia was required for the first stage only and that the other stages could be performed, if necessary, in the patient's room. In the first stage the field was exposed by turning a flap of skin and muscles and by removing several ribs. The affected portion of the lung was then in view, covered by pleura which was usually densely adherent. If not, the first stage was then terminated after placing an iodoform gauze pack on the pleura. He added that if the patient was apprehensive a little nitrous oxide and oxygen could be employed. In the presence of an adherent pleura, a large soldering iron was heated to a red heat and an excavation made into the lung tissues. The operation was not complete until all diseased tissue had been removed with the cautery, but could be performed in as many stages as desired.

A few years later Lilienthal published a two-volume textbook on thoracic surgery. It is interesting to include his short chapter on accepting the patient for lobectomy: "Not only because of its danger, but because at the present time the operation is not the usual one, it is desirable to present the main facts and arguments in the case to the patient's family, or if he is alone, to the patient himself. The matter is a delicate one and requires much tact and gentleness with absolutely no hint of persuasion. If the surgeon believes that lobectomy in a given case is the operation of choice, the prognosis should be viewed from all angles and general figures of mortality, cure, and probable variations should be conservatively estimated. As to the particular case at hand, however, there should be no promises, but it is admissible to dwell on the great improbability of death on the operating table. It is also right to counteract the effect of the depressing mortality with the picture of a successful result and restored health. In reply to the question as to the probable period of convalescence, we may look forward to two months in the hospital and seven to twelve months longer for the patient's convalescence.

"After the interview, the patient ought to take a day or two to make up his mind and only in the acute progressive cases should we insist upon a more prompt decision."

Roentgen techniques were improving slowly. And satisfactory bronchograms could be obtained by the use of lipiodol introduced by Sicard and Forestier in 1922. Wide application of this method and a general appreciation of the detailed surgical anatomy of the lungs were chiefly of academic interest, however, until the operative mortality of lobectomy was reduced.

Until after 1929, practically all of the attempts to excise diseased lung tissue for suppurative disease were accomplished by Graham's cautery method, by Whittemore's operation in which he exteriorized the diseased lobe, secured the base of the lobe to the chest wall, and allowed it to slough off, or by multiple stage lobectomy. Hedblom and others still employed thoracoplasty in selected cases. Phrenic nerve crushing or division was used both as a therapeutic measure and preliminary to later operations.

In 1929, Harold Brunn of San Francisco presented a paper describing 6 one-stage lobectomies for bronchiectasis, with only 1 death. Interest was again aroused in the operation. And as more experience was accumulated by more surgeons the mortality rates gradually decreased.

In 1935, Graham, Singer, and Ballon, in their book "Surgical Diseases of the Chest," reviewed in detail the results of lobectomy for bronchiectasis, citing the experiences of various surgeons throughout the world. Their conclusion was, "It would appear, therefore, that the operation of lobectomy for bronchiectasis has been successfully revived. It must be emphasized again, however, that the procedure still carries with it a high operative mortality and that every patient who survives the operation is not necessarily relieved of all his symptoms."

Early one-stage lobectomies were almost always performed by the tourniquet technique. Several years were required before the precise anatomy of the hilum of the lobe was of any

practical importance. Individual ligation technique of the vessels and bronchi was eventually developed and accepted. Churchill and Belsey first applied their knowledge of segmental anatomy for cases of bronchiectasis in 1939. Kent, Brock, Huber, Jackson, Overholt, and others have further developed the knowledge and application of lobar and segmental anatomy both in bronchiectasis and tuberculosis.

Even before antibiotics were available the mortality and morbidity of pulmonary lobectomy for bronchiectasis in the late 1930's had reached a respectable level. Protection with chemotherapy further increased the safety and the removal of a lobe or lung has become a standard, safe operation.

The surgical treatment of pulmonary abscess and gangrene, however, did not improve a great deal until antibiotics were available and generally employed. The disease was common and the subject of extensive discussions regarding both etiology and treatment. There were sharp differences of opinion concerning the proper time to operate upon cases of lung abscess, varying from Neuhoff and Touroff's radical approach of early operation to more conservative long term trials of postural drainage and repeated bronchoscopy. Later lobectomy was performed more often for chronic lung abscess, but the morbidity and mortality remained high. It was not until the antibiotics were used to abort or attenuate the disease that treatment became satisfactory. Lung abscess is now a rare disease and it is unusual to find a case in which drainage is indicated. Excision of the involved lobe for chronic lung abscesses is now the treatment of choice.

Medical literature in the 1920's contained relatively few accounts of primary carcinoma of the lung. In 1922, Barron reviewed 4,362 autopsies performed at the University of Minnesota and found 13 cases of carcinoma of the lung. He noted the condition was three times as frequent in males and most common in the sixth decade. The authors suggested that chronic inflammation following influenza might account for the striking increase in the number of cases. In 1923, Playfair and Wakely published in the British Journal of Surgery an account of 4 cases of primary carcinoma of the lung among 3,183 postmortem examinations—an incidence of 0.1 per cent. They concluded, however, for reasons not stated, that primary carcinoma of the lung was probably more common than generally believed. They thought that chronic, inflammatory infections preceded the cancer and suggested that the etiology might be chronic bronchitis. Before 1933, there were only 6 recorded cases of lobectomy for carcinoma of the lung with survival for a year following operation. In all of these cases only a lobe had been removed, except in Churchill's case in which the right middle and lower lobes were excised.

In 1931, Nissen, then of Berlin, removed the left lung for bronchiectasis in a 12 year old girl. He employed a mass ligature of the hilum and allowed the lung to slough out. Cameron Haight, of Ann Arbor, performed the second successful pneumonectomy in a human being using a similar technique.

On February 27, 1933, Evarts Graham performed the first successful pneumonectomy for lung cancer. The operation was performed in one stage with a partial thoracoplasty to reduce the size of the pleural space. The patient is alive and well today.

Rienhoff and Overholt followed with successful one-stage operations, and the former made valuable observations concerning the management of the pulmonary hilum by individual ligation for total pneumonectomy from an anterior approach. He also advocated omitting thoracoplasty following the removal of the lung.

Mortality following pneumonectomy was discouragingly high for the next several years. If the patient survived the operation there was an excellent chance that the bronchus would open and a fatal, putrid empyema would result. There was no antibiotic protection; infection was the rule, not the exception. Blood transfusions were used sparingly. For example, in Graham's report of his first case he states, "The patient left the operating room in excellent condition but was nevertheless given a transfusion of 500 c.c. of blood."

Some of the vicissitudes of the earlier operations are apparent from this account by Alton Ochsner.

"My first pneumonectomy for cancer was performed on April 15, 1936. The tumor was in the left main stem bronchus and, of course, caused considerable stir, because it was the first pneumonectomy that had ever been done in this part of the country. After getting the lung out and closing the bronchus, the pathologist looked at the specimen and informed me that there was no tumor in the bronchus. Dr. LeJeune, who had

done the bronchoscopy, then informed me that the tumor was just beyond the carina and that I must have left the tumor in. I immediately went back, mobilized the bronchus further, divided the bronchus at its junction with the trachea with considerable trepidation, and sure enough the tumor was in the segment of bronchus which had been left behind. That man survived and is still working every day as a dirt farmer. I am sure if he had succumbed that I would not have had the heart to have done any more."

Today the fear of the operation itself is trivial compared to the fear of the disease which makes the operation necessary.

The surgery of tuberculosis during the 1920's proceeded somewhat more rapidly and in a more satisfactory way than surgery for suppurative disease or tumors of the lung. Both in England and this country, a rather standard pattern was observed. If the patient did not respond to sanatorium care, collapse therapy would be recommended—and this was true particularly in far advanced cases. If pneumothorax combined with pneumonolysis of the internal type devised by Jacobeus in 1913 was not satisfactory, a thoracoplasty would be recommended. During the same period John Alexander (Fig. 5), in our country, and Sauerbruch, of Germany, were slowly convincing their medical colleagues of the relative safety and the tremendous value of collapse therapy and, particularly, thoracoplasty in tuberculosis.

Alexander's book "The Surgery of Pulmonary Tuberculosis," published in 1925, stimulated surgeons throughout the world to explore and employ surgical therapy for the disease. It is interesting to note, however, that as late as 1924 Alexander stated that the present working rule is that thoracoplasty is never to be done when a satisfactory artificial pneumothorax is obtainable.

During the next 2 decades interest in collapse therapy for tuberculosis increased and the selection of patients improved. John Alexander's second book "The Collapse Therapy of Pulmonary Tuberculosis," the bible of the subject, appeared in 1937. A paragraph from his book is revealing: "In view of the excellent clinical results that may be obtained from a combination of the sanatorium regime and collapse therapy, the removal of a portion of the lung can no longer be seriously considered for early or limited lesions. The resection of a portion of a tuberculous lung is inevitably a hazardous operation, whereas the collapse therapy operations that are used for limited lesions are attended by very little danger."

FIG. 5. John Alexander, 1891–1954. A photograph made in the early 1930's. Distinguished thoracic surgeon and world recognized leader in the surgery of tuberculosis.

In 1943, the report of Churchill and Klopstock revived interest in the possibilities of lobectomy in tuberculosis. But Maier and Sweet after a 3 year follow-up believed that the end results were not satisfactory. It was not until the antituberculosis drugs became available that excision of lung tissue for tuberculosis became an acceptable procedure. Now large series of lobectomies and segmental resections of the lung have been reported by Chamberlain, Himmelstein, Berry, Clagett, Gale, and others. Technical improvements have led to the wider application of partial lobectomy for the disease, particularly since the work of Medlar and his associates on the pathogenesis of tuberculosis has become known.

The mass research on the importance of the antituberculosis drugs conducted by the Veterans Administration, under the direction of John Barnwell, has been particularly important in the

development of pulmonary resection for tuberculosis.

With the treacherous multiform disease tuberculosis, more time must elapse before the relative merits of early segmental resection of diseased foci, lobectomy, and other procedures can finally be evaluated.

Opportunities to perform cardiac surgery were limited from 1920 until very recent years. There was, however, some progress with valvular heart disease, and early attempts were made to study coronary disease from a surgical approach. Important contributions on the management of trauma of the heart were made by Bigger, Elkin, and others.

Jonnesco and Leriche had already proposed operations on the sympathetic nervous system for coronary disease. And later, Fauteux advocated pericoronary neurectomy.

Doyen's operation for pulmonary stenosis in 1913 and Tuffier's temporarily successful finger dilatation for aortic stenosis have already been noted. Beginning in 1923 and up to 1928, Cutler, Levine, and Beck employed a tenotome and later a cardiovalvulotome for mitral stenosis. Allen and Graham, in 1923, described a cardioscope for the same purpose. It is of great significance, in view of later developments, that in 1925 Souttar, of London, performed successfully a finger dilatation for mitral stenosis with a good result.

In answer to my request for information concerning his successful case, Sir Henry Souttar graciously supplied me with a photostat of his paper published in 1925 in the British Medical Journal. The original reprints were not available. After reviewing the article it appears to me the modesty and courage of this great surgeon are more vividly expressed in his accompanying letter than in the original description of the case. Accordingly, it is recorded:

"Dear Dr. Blades,

"Very many thanks for your letter regarding my case of Valvulotomy. I had not a reprint of my article available to send to you, but I have obtained a photostat which will give you a full account of the operation, and which to me at any rate brings back the occasion quite vividly! Lily Hine was 19 at the time of the operation, and I feel that its success owed much to her courage in the face of a very great handicap. She made an uninterrupted recovery and lived in very fair health for five years. At the end of that time she suddenly developed a cerebral embolus, presumably from a clot in the auricle, and died quite shortly after. I feel that any credit for the result ought to be shared with herself and my Anaesthetist, Dr. John Challis, and in any account I should be grateful if their names were mentioned.

"To me the chief lessons of the adventure were the facility of the procedure, the absence of any serious disturbance of the heart's action, even when the current was completely cut off by the finger in the valve, the vivid and accurate information which the finger could obtain, and perhaps most of all the terrific character of the regurgitation. At that time however it was an article of faith with Physicians that the valves were of no importance and that the only thing that mattered was the condition of the cardiac muscle. In that atmosphere I was naturally unable to obtain another case, in spite of this one complete success. It was a pity but easy to understand.

"In those days opening the chest was an adventure, and one must remember what a difference has been made by modern anesthesia, blood transfusion and anti-biotics. Looking back on it coldly I was perhaps too adventurous—but it did come off!

With very kind regards
Sincerely yours
/s/ Henry Souttar"

Following these initial attempts, a quarter century passed before any significant progress was made. The subject was revived by the late Horace Smithy, followed rapidly by Bailey, Harken, Glover, and others. Their recent contributions on the surgical treatment of mitral and other valvular heart disease have been so rapid and dramatic that they are difficult to follow from day to day. Largely through the observations of Brock, direct attacks on pulmonic stenosis have been achieved. Operations for aortic stenosis and insufficiency of the heart valves have not enjoyed the success and relatively low mortality as those for mitral stenosis, but they are receiving the attention of the pioneers in these fields.

Led by John Gibbon, Jr., of Philadelphia, many brilliant investigators are seeking a satisfactory pump to furnish oxygenated blood to the heart as it is by-passed. A few intracardiac opera-

tions have already been performed with the aid of extracorporeal pumps. Recently Lillehei and Varco, at the University of Minnesota, successfully applied a crosstransfusion technique for open cardiotomy. A number of open intracardiac operations has been performed under hypothermia to protect the brain, kidney, liver, and extremities during the procedure. Temple Fay's earlier observations on hypothermia in the treatment of carcinoma were applied to problems of cardiac surgery by Boerma, DeLorme, and Bigelow in their fundamental studies. Henry Swan's later experimental and clinical work has been a valuable contribution in this field.

The earliest and most important experimental work concerning surgical intervention for coronary disease was begun by Claude Beck in 1932. Since that time he has worked with faithful tenacity applying various approaches and techniques in an effort to establish a satisfactory method of treatment. O'Shaughnessy duplicated the principles outlined by Beck, using omental grafts, and, later, Thompson, of New York, utilized sterile talc to increase the coronary blood supply. Current developments by Beck include a shunt from the aorta to the coronary sinus to provide oxygenated blood to the myocardium. Perhaps, however, his Beck II operation, in which he uses asbestos powder on the myocardium with partial occlusion of the coronary sinus, is more appealing. Vineberg advocates implantation of the internal mammary artery in the myocardium.

Adams and Phemister, in 1938, performed the first successful transthoracic esophagogastrostomy. Garlock, Ochsner, B. N. Carter, and others have proved the feasibility of mobilizing the stomach to allow extremely high intrathoracic anastomoses. Richard Sweet, of Boston, a notable and extremely able pioneer in all aspects of thoracic surgery, is particularly well known for his work on esophageal surgery. Allison, of England, has contributed much to the knowledge and management of peptic ulceration of the esophagus and to proper understanding of the treatment of hiatal hernia.

Despite the efforts of these brilliant contributors, the results of resection of the esophagus for carcinoma are discouraging. The nature of the disease and the organ involved account for most of the failures.

Benign lesions are, in general, amenable to surgical intervention. In addition to the work of Allison and Sweet, contributions by Wangensteen and his group have greatly improved the management of hiatal hernia. Another important milestone in surgery of the esophagus was the closure of a tracheoesophageal fistula and successful anastomosis of the proximal and distal segments of the esophagus by Haight in 1943.

The observations of Carrel, Matas, and others at the turn of the century have already been mentioned in connection with blood vessel surgery. In 1908, Trendelenberg attempted the operation for removal of an embolus from the pulmonary artery. However, it was not until 1924 that the operation was performed successfully by Kirschner. In later years the procedure was abandoned. Aneurysms were occasionally treated by wiring, usually for the relief of pain.

In 1937, Graybiel, Strieder, and Boyer were unsuccessful in an attempt to ligate a patent ductus arteriosus. The following year Gross reported the first successful operation for closure of the defect. At that time not only was the method valuable in prolonging the lives of patients with the anomaly, but it furnished, as shown by Touroff and Vessel, the first effectual method for the treatment of bacterial endarteritis before antibiotics were available.

In 1945, after years of experimental studies in blood vessel surgery, Alfred Blalock successfully operated in a case of the tetralogy of Fallot. During the same year, Crafoord and Gross almost simultaneously reported the resection and end-to-end anastomosis for coarctation of the aorta. The following year Willis Potts and his associates described their operation in the tetralogy of Fallot which consisted of a side-to-side anastomosis of the aorta to the pulmonary artery. During the next decade blood vessel surgery steadily progressed in an almost incredible way. The work of Gross and Hufnagel, Blakemore, Harkins, McCune and others, with blood vessel grafts, and very recently the development of vinyon N and various plastic materials for blood vessel replacement constitute the beginnings of a new and feasible surgical approach to many diseases which in the past were considered hopeless. Before we consider other accomplishments in the surgery of blood vessels, tribute must be paid to Emile Holman for his less dramatic but equally important observations in this field.

In Carrel's work from 1900 to 1910, for which he received the Nobel prize in 1912, he recorded

the basis of modern surgery for the treatment of aortic aneurysms and blood vessel anastomosis. It was not until almost 40 years later, however, that Carrel's original observations were realistically applied to an aneurysm of the aorta.

In March, 1951, Dubost of France excised an aneurysm of the lower end of the aorta and bridged the defect with a homologous graft. Bahnson, DeBakey and Cooley, Brock, Blakemore, Julian, and others have made brilliant contributions to the surgical treatment of thoracic aneurysms.

The experiences of World War I established a pattern for the care of chest wounds for the intervening years until World War II. It is important to note, however, that many of the lessons learned in World War I were forgotten and had to be re-established a quarter of a century later.

Between wars, important contributions were made to the treatment of penetrating wounds of the heart by Bigger, Elkin, and Blalock, and during World War II, Dwight Harkin operated on a large series of patients with foreign bodies in or near the heart. This experience has served him well in his later brilliant contributions to cardiac surgery.

For the first time in any war, there were available during World War II and our more recent conflict, competent, vigorous surgeons trained in surgery of the chest. And for the first time in our history their talents were utilized in the fields they knew best.

Tribute is paid to the late Fred Rankin, Chief Surgical Consultant during World War II, and former Surgeon General Norman T. Kirk for establishing the policies which, as nearly as possible, placed surgeons in positions in which their talents were utilized fully.

The treatment of hemothorax, the extensive use of decortication for chronic hemothorax, and the proper selection and management of chest wounds resulted in the dramatic reduction of the mortality and morbidity. The control of chest pain and attention to free airways for oxygen exchange in a condition termed "traumatic wet lung" should be included among the valuable contributions made by Samson, Burford, Brewer, Shefts, Tuttle, and many others in World War II.

During the past few years the use of tracheotomy in patients with severe chest wounds has been advocated by B. N. Carter and his associates. Not only does this procedure furnish a method to keep the tracheobronchial tree aspirated clear of secretions, but a reduction in dead air space in the severely injured patient may be life saving.

Within a half century thoracic surgery has progressed from its faltering, dangerous, formative stage to a recognized surgical specialty. The Board of Thoracic Surgery was formed in 1948 as an affiliate of the American Board of Surgery. There are 228 members in the Founders Group and 275 certified by examination. Thoracic Surgery is now a specialty but not a narrow specialty. It was developed by general surgeons and future progress is in the hands of men trained first in general surgery. Even if their practices are limited to surgery of the chest, their interests and philosophies are not confined.

Individual credit has been given to some of the pioneers and to a few of the history makers of today in scanning chest surgery of the past 50 years. Probably many who should have been included were not.

All surgeons who have made contributions, whether dramatic "firsts", less spectacular but fundamental developments, or only the important task of performing day by day the highest type of clinical surgery should survey their accomplishments with deep humility. Their successes, whatever they may have been, were made possible by the chemists, bacteriologists, physiologists, and anesthesiologists who have worked with and for them, with little glory or reward.

CONTINUED FROM APRIL 1955 ISSUE PP. 309-352

A HALF CENTURY OF EFFORT TO CONTROL CANCER

An Appraisal of the Problem and an Estimation of Accomplishments

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TREATMENT OF CANCER OF THE BREAST

The radical mastectomy of Halsted and Meyer represents one of the finest cancer operations devised because it embodies the principle of treatment whereby the primary tumor, the intervening lymphatics, and the regional lymph nodes are removed en masse. Halsted described the radical mastectomy on November 2, 1894; 10 days later, on November 12, Willy Meyer presented his paper before the Surgical Section of the New York Academy of Medicine. Each had independently conceived and executed the operative procedure. Today the operation stands unchanged in principle and practice although experiments are now being conducted to note the effects of extending the classical radical mastectomy. Thus, 1894 marks the commencement of our present concept of treating breast cancer by radical surgical extirpation.

Breast cancer has been known since the earliest of times. Hippocrates (400 B.C.) described it and denounced any operative procedure upon breast cancer as futile. Celsus (100 B.C.) first described three stages of this neoplasm: "The cacoethis, the scirrhus, and the stage of ulceration." He presented the first contraindication to surgical extirpation of breast cancer by stating that when the cancer had reached the stage of ulceration, surgery should not be attempted.

Galen (130–200 A.D.) advocated "a clean sweep with the knife" for breast cancer and concurred that once ulceration had occurred, surgery was contraindicated. Many surgeons in that period operated upon neoplasms of the breast and recorded their techniques and accomplishments. Leonidas (200 A.D.), Avicenna (980–1007 A.D.), and Albucasis (1000–1100 A.D.) of Arabia, Guy de Chauliac (1300–1370), Ambroise Pare (1509–1590) of France, and Scultetus (1595–1645) of Greece advocated various forms of excision or cauterization of breast neoplasms. Fabricius ab Aquapendente (1537–1619), an Italian professor and teacher of William Harvey, performed a radical breast resection only at the patient's request and proclaimed the worthlessness of anything less than total extirpation. Severinus (1580–1656) was the first to advocate the removal of benign tumors because of the possibility of their becoming malignant, and also the first to remove a large axillary node at the time he removed a breast cancer.

Various mystic beliefs and bizarre methods of treating breast cancer were practiced during this period. Francisco Arces (1493), a Spaniard, divided the cancerous breast lengthwise and caused the tumor to slough by means of a ligature. Leonard Fuchs (1501), a German, compressed the cancer of the breast by means of a lead plate. The development of the "royal touch" as a means of curing breast cancer was practiced by Queen Elizabeth and Edward the Confessor, but condemned by William III who said, "May God give you better health and better sense." Queen Elizabeth wore a breast ring which she suspended between her breasts and this ring had the virtue of "expelling infected air." Similar amulets of asafetida were often worn (From Edward F. Lewison).

The great French surgeon of the latter part of the seventeenth century, Jean Louis Petit, advocated wide surgical excision of the primary breast tumor and dissection in continuity with the axillary lymph nodes. He further preached the doctrine of removal of the pectoral fascia and even of some muscle fibers. However, he

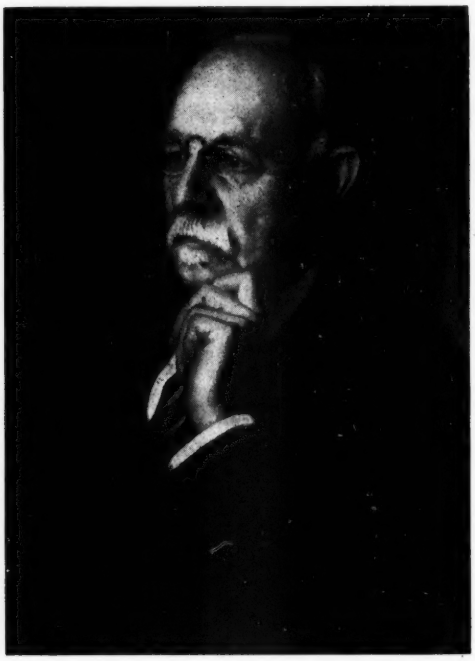


FIG. 19. William Stewart Halsted. (Portrait by Thomas Corner in the lobby of the Halsted Surgical Building of the Johns Hopkins Hospital, Baltimore, Maryland.)

removed as little skin as possible, even leaving the nipple. Petit further advocated that the breast should not be incised during the operation, but should be "cut about." Petit's concept spread throughout all Europe.

The latter half of the eighteenth century and the first half of the nineteenth, witnessed attempts to develop a suitable operative procedure for mammary cancer. Benjamin Bell (1749–1806) and Sir Astley Paston Cooper (1840) performed numerous dissections, and James Syme (1799–1870) in England and Joseph Pancoast (1844) in America advocated that a great deal of skin should be removed and as much as possible of the breast muscles and glands, "all in one piece."

Charles Hewitt Moore, surgeon at the Middlesex Hospital (1829–1870), published in 1867 a paper entitled "The Influence of Inadequate Operation on the Theory of Cancer." He stated that besides the breast, all adjoining structures, skin, muscle, and glands, should be removed in the same mass as the breast. The German surgeons adopted Moore's policy and Richard von Volkmann (1875) advised the removal of the entire breast, large segments of the skin, fascia, and muscle: he removed the pectoralis major and at times the pectoralis minor muscle as well. Heidenhain believed that cancer cells were propagated through the lymphatics by means of muscular action, and advocated removal of the pectoral muscles when the breast cancer had become adherent to them.

At this time both Halsted and Meyer went to Germany to study and came under the influence of the existent doctrines or patterns for the surgical treatment of breast cancer. Edward Lewison, in reviewing the history of breast cancer in volume 34 of *Surgery*, 1953, makes the following statement pertaining to Halsted's presentation: "Thus, although the seeds for the complete radical operation for breast cancer were already planted in the minds of many men, it remained for Dr. William Stewart Halsted to culminate the operation and germinate the present modern method. The fertile mind of Halsted was, so to speak, made up of all the minds of the preceding ages."

Most of the present attempts to extend the Halsted mastectomy were practiced at one time or another by Halsted himself. In 1898 he stated, "The supraclavicular region is almost invariably cleaned out. To do this we no longer divide the clavicle as we did five or six years ago." He describes instances in which Bloodgood performed neck dissections for breast cancer, and 3 instances in which Cushing, then House Surgeon, resected the anterior mediastinum for recurring cancer, and he states, "It is likely, I think, that we shall in the near future remove the mediastinal contents at some of our primary operations. A part of the chest wall I believe should be excised in certain cases . . ." In a letter written to William Welch on August 26, 1922, Halsted gives credit for the routine removal of the pectoralis minor muscle to Willy Meyer. He states, "I insisted that all the tissue should be removed in one piece and upon the meticulous cleaning out of the axilla and its estuaries (subclavicular and supraclavicular fossae). I warned of the danger of excising pieces of malignant tumors for microscopic examination unless the operation followed immediately and was, I think, one of the first surgeons in this country able macroscopically to make the diagnosis of the common tumors."

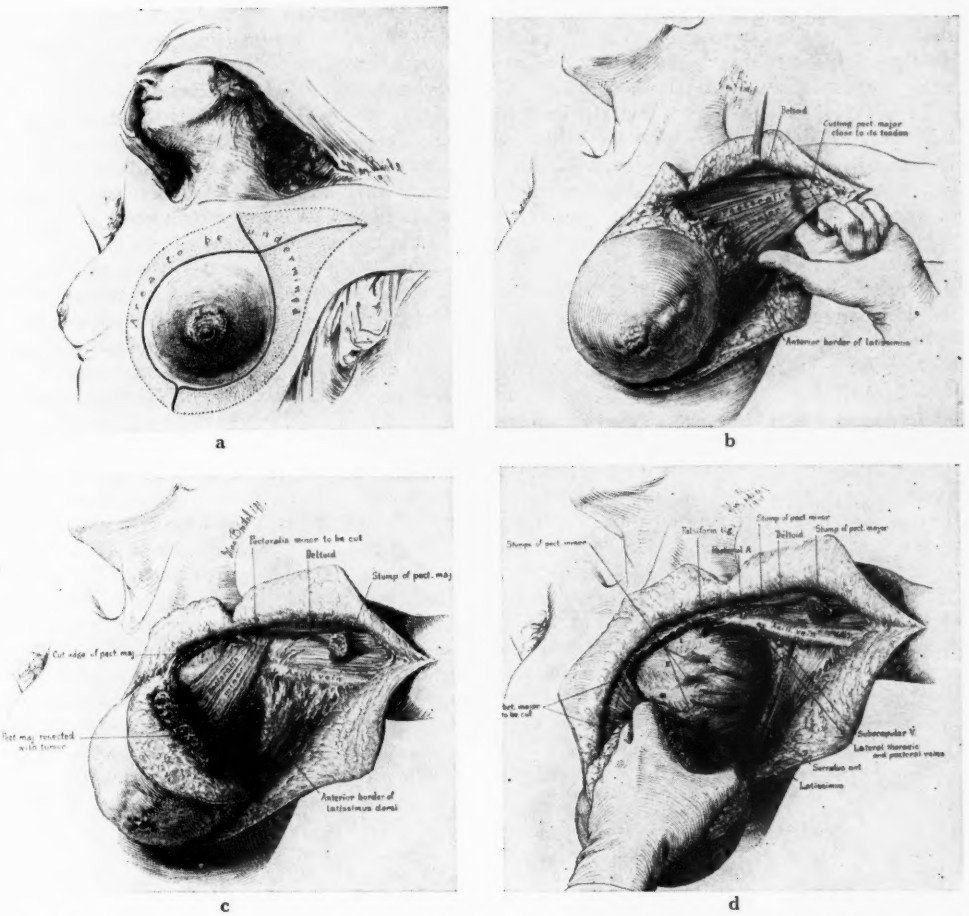


FIG. 20. Halsted radical mastectomy. (Photographic copies of original and unpublished drawings by Max Brödel. From Edward Lewison. *Breast Cancer and Its Diagnosis and Treatment.* Williams and Wilkins Company.)

In 1954, 60 years after the description of the classical radical mastectomy, the status of treating breast cancer is in a dilemma. Two routes of deviation are being practiced. On the one hand, McWhirter of Edinburgh goes back to the policies of Borak (1936), Grace (1937), Mitchiner, Bailey, and Price (1937), Erskine (1935), and other continental surgeons in the advocation of simple mastectomy followed by carefully planned radiotherapy. He believes that in so doing he has increased his salvage rate. He started this technique in the early 1940's and is enthusiastic about its possibilities. However, when compared with his statistics, results from radical mastectomy are between 4 and 9 per cent better in every category.

At the other extreme are efforts at the extension of radical mastectomy. In the 1920's, Handley of England called attention to the frequency of internal mammary node metastases from primary operable breast cancer and at that time advocated the insertion of radon capsules into the intercostal spaces and also into the supraclavicular area. Sampson Handley also performed several excisions of the internal mammary nodes, but not in continuity; the nodes were merely plucked from the intercostal spaces following radical mastectomy. He came to the

conclusion that the operation was too risky and that it was preferable to insert radon capsules. This procedure apparently did not succeed and it was gradually abandoned.

In 1949, 1952, and more recently in 1954, Richard S. Handley, Surgeon at the Middlesex Hospital in London and son of Sampson Handley, again called attention to the importance of the internal mammary lymph nodes. He demonstrated, by biopsy of the internal mammary nodes at the time of radical mastectomy, that approximately 55 per cent of the medial half lesions would show metastases in the internal mammary nodes and about 15 to 18 per cent of the lateral half lesions shared this early spread to the internal mammary chain. In the beginning he came to the conclusion that internal mammary node metastases were a sign of inoperability and that before undergoing radical mastectomy a patient should undergo exploration of the internal mammary nodes. If the nodes were positive, a simple mastectomy and aggressive x-ray therapy would be indicated. More recently he considers that en bloc excision of the internal mammary nodes is the preferable method of treating this avenue of spread. Beginning in 1949, after the first publication of Richard Handley, Professor Mario Margotinni in Rome removed the internal mammary nodes in every patient with primary operable breast cancer. At the present time he has done approximately 500 such operations and has shown metastases in these nodes in approximately 22 per cent of all the patients undergoing this procedure. His method was not an en bloc resection. Rather, at the close of the radical mastectomy, he would split the costal cartilages, retract their edges, and remove the nodes extrapleurally. More recently he removed the costal cartilages and, following this, excised the internal mammary vessels together with the adjoining nodes and fatty tissues, also extrapleurally.

In the 1940's, Dahl-Iversen in Copenhagen performed a low neck dissection in a series of patients with breast cancer and demonstrated at that time that 33 per cent of the patients with axillary metastases had involved nodes in the supraclavicular region. However, in a subsequent paper published on January 23, 1954, he admits that several patients in the first series had definitely inoperable cancers so that the incidence of supraclavicular metastases is weighted by such inclusion. In his recent publication he has advocated simultaneous radical mastectomy, low neck dissection, and internal mammary chain resection. Of 100 patients undergoing this procedure, only 3 had metastases in the neck nodes, 55 showed all nodes to be negative, 17 had metastases in the internal mammary nodes, and 41 had metastases in the axillary nodes. The neck nodes were never found to contain metastatic cancer except in the presence of metastases in the axillary nodes.

During the past 7 years, Wangensteen at the University of Minnesota has devised a so-called "super radical mastectomy" which consists of a radical mastectomy, a low neck dissection, and a mediastinal lymphadenectomy. This is not an en bloc dissection. Although about 60 per cent of his patients show cancer extending beyond the confines of the conventional radical mastectomy procedure, he has had a 13 per cent operative mortality and applies this procedure mainly for patients who have more advanced cancers.

Jerome Urban began to remove the internal mammary chain en bloc in association with the radical mastectomy procedure as a one stage procedure in March, 1951. Since then 175 patients have been so operated upon with only 1 postoperative death. Approximately 36 per cent of the patients have metastatic involvement of the internal mammary nodes. Thirteen per cent of the patients who had no metastases in the axillary nodes showed positive findings in the internal mammary nodes.

Thus, the first 50 years of the twentieth century have demonstrated the accomplishment of curing breast cancer by radical mastectomy as described at the end of the last century and practiced throughout the beginning of this one. The second half of the twentieth century will demonstrate the possible accomplishments of the extended radical procedures. The effect of radiation therapy in increasing the salvage rate has been doubtful and it has not been proved that irradiation will cure breast cancer in a significant number of patients. However, irradiation is of inestimable value in offering palliation to the patient with breast cancer. Other ancillary methods of treating breast cancer consist of surgical castration, first suggested by Schinzinger in 1886 and performed by Beatson in 1888. Castration by irradiation has been used to produce satisfactory results by Dresser (1936), Taylor (1939), and Smith (1936).

Effects of Administering Hormones to Patients with Breast Cancer

Loeser, in 1941, used testosterone and noted no effect upon the course of active cancer. Joseph Farrow, working on Adair's Breast Service in Memorial Hospital, reported in 1944: ". . . It is apparent that the administration of large doses of synthetic androgens not only failed to inhibit the growth of metastatic mammary cancer but seemed to increase its activity in the skeletal system in both sexes." It is indeed fortunate that Julian Herrmann then pursued the investigation of hormonal administration to patients with breast cancer at the same clinic. He observed beneficial effects of androgen administration both in curbing tumor progression and in producing marked palliation (1945), and for certain patients (usually postmenopausal), estrogens had a similar effect, as initially described by Haddow. These initial observations were expanded by Herrmann and Adair in New York and were independently observed by Nathanson in Boston.

THE TREATMENT OF CANCER OF THE LUNG

The chest was one of the last anatomic regions to be surgically invaded. Five major problems faced the prospective thoracic surgeon:

1. What were the effects of ligating the pulmonary artery? Rapid death associated with pulmonary embolism evoked apprehension regarding the effect of pulmonary artery ligation.
2. How should the dead space of the pleural cavity, resulting after pneumonectomy, be managed?
3. Could the brachial stump be closed routinely?
4. Could proper anesthesia be developed?
5. Would the patient become a pulmonary cripple after pneumonectomy?

The earliest pulmonary surgery was performed on experimental animals and showed the feasibility of safely resecting the lung. Lobectomy for bronchiectasis by Brunn and by Shenstone (1932) encouraged Overholt to perform a lobectomy for cancer on April 27, 1932. His patient remained asymptomatic but succumbed from the cancer 10 months after operation. Kummell, in 1910, attempted to remove a lung for cancer, but the patient died within the first postoperative week. Lilienthal, in 1919, performed a right pneumonectomy for bronchiectasis; the patient died within 6 hours. He attempted it again in 1920 with another fatality from hemorrhage. Willy Meyer, in 1920, also removed a lung from a patient who died during the postoperative course. In 1931, Nissen performed the first successful pneumonectomy in a child for bronchiectasis. He passed an elastic ligature about the lung hilus, after having obtained adhesion in a previously staged operation, and permitted the lung to slough away. Haight, in 1932, also performed gradual pneumonectomy for bronchiectasis in a child by ligating the hilus and permitting the lung to slough. Sauerbruch, in 1933, devised an operation of multiple stage resections, permitting the lung to slough away. Windsberg performed a partial pneumonectomy for bronchiectasis by the multiple stage operation in 1932.

Credit for the first successful pneumonectomy for cancer goes to Evarts Graham who, in April, 1933, performed the operation for a squamous cell carcinoma involving the bronchus of the left upper lobe. The diagnosis had been made by biopsy obtained on bronchoscopy by M. F. Arbuckle. It had been planned to remove only one lobe during the operation, but it was found that there was no satisfactory interlobar fissure and the tumor had transgressed beyond the one lobe. Therefore a total pneumonectomy was performed. The patient is actively engaged in the practice of obstetrics in Pittsburgh now, some 21 years later. The operation as performed by Graham consisted of a transfixing ligature of catgut for the hilus, but the pulmonary artery was ligated separately. Because of fear concerning the effect of the empty thoracic space, a thoracoplasty was performed with removal of the third to ninth ribs, inclusive. The patient developed a small empyema of the operative cavity at a later date and therefore the first and second ribs were also removed.

Rienhoff, at Johns Hopkins University, was working experimentally to devise a planned pneumonectomy at the same time that Graham performed his successful pneumonectomy, and on July 3, 1933 performed a total pneumonectomy for a fibrosarcoma of the left lung in a 3.5 year old child. This was the first time the mediastinal pleura was opened. He was the first to prove that thoracoplasty is not essential for survival following pneumonectomy, and to plan and conduct a dissection of the pulmonary hilus with careful ligation of each individual

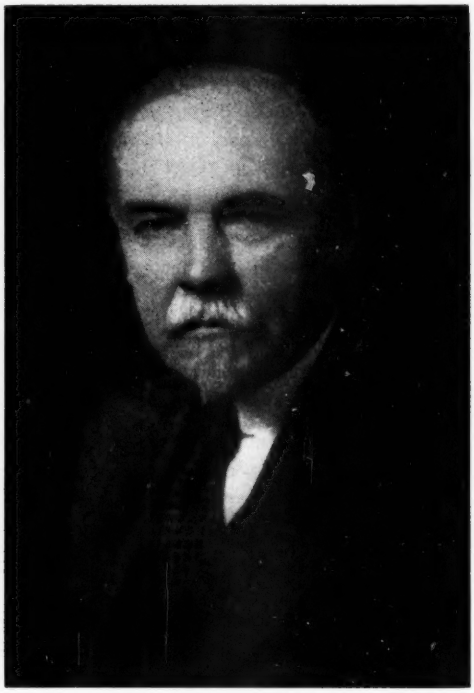


FIG. 21. Franz J. A. Torek.

structure there, akin to the technique as practiced today. Further technical problems were met and settled. Rouviere demonstrated different lymphatic spread from tumors of the right and left lungs and this resulted in different operative procedures for each side. Weinberg, in California, studied routes of metastatic spread by injecting methylene blue and studying the distribution of this dye in the various lymphatic structures within the chest. He helped to develop the operation of radical pneumonectomy in which not only the lung but also the intervening lymphatics and the mediastinal lymph nodes are dissected in continuity. These radical procedures have been performed by Watson and Pool, and others. Invasion of, or adherence to, the pericardium and thoracic cage have led to successful segmental removal of these structures.

Rienhoff during his first pneumonectomy showed that after the removal of the lung, a fibrous thorax is developed which causes an elevation of the diaphragm, a shifting of the mediastinal structures to the side operated upon, and a pulling in of the ribs with narrowing of the interspaces, the remaining lung on the contralateral side undergoing compensatory dilatation and thus increasing the vital capacity to about the normal of that individual.

Improvement in anesthesia was the most important factor in encouraging intrathoracic operations. Earlier thoracic surgeons operated in rooms in which positive pressure was maintained, a procedure first employed in the United States by Rudolph Matas of New Orleans. It was used in the experimental laboratory until the late 1920's when human beings were afforded the same benefit that animals had received, and open chest procedures became relatively safe. The simple expediency of an endotracheal tube and the use of a blown rubber bag was all that was necessary. The present use of curare and sodium pentothal with the patient breathing oxygen by pressure insures a motionless mediastinum. Present day efforts revolve about a better understanding of oxygen-carbon dioxide tension during operation. The use of a portable mass spectrometer in the operating room, as described by Fletcher Miller and his colleagues, is contributing greatly to this effort.

The successful performance of pneumonectomies was most timely because of the present high incidence of pulmonary cancer. The perfection of bronchoscopy by Chevalier Jackson during the first decade of the twentieth century and the development of roentgenographic techniques, including equipment for mass screening and tomography, were developments of the second and third decades. Cancer of the lung did not become a serious public health problem from a numerical standpoint until the middle forties. This gave the radiologist, the bronchoscopist, the surgeon, and the anesthetist about 15 years in which to perfect their techniques before the profession was confronted with a tremendous number of patients bearing pulmonary cancer. The operative mortality for pneumonectomy has now been reduced to approximately 1 to 5 per cent. Unhappily, the so-called superior pulmonary sulcus tumors, as described by Pancoast, still await a successful method of treatment.

Certain tumors, earlier nonresectable because of their proximity to the bifurcation of the trachea, are now treated by segmental resection of the trachea and the use of artificial grafts, either of organic or plastic material, to bridge

the defect. Success in this field has been reported by Clagett and others.

Radiation therapy has proved most valuable for patients whose cancers are inoperable. The usual deep x-ray therapy will at times be most valuable for palliation in patients with inoperable cancer, but care must be exercised to prevent the harmful radiation effects from vitiating the benefits from surgery. Efforts at interstitial radon seed implantation at the site of operation have proved beneficial. The recent use of artificial radioactive isotopes with the implantation of such isotopes is being investigated. Rotation therapy either of the medium voltage or the supervoltage range is also being used with improved results because of the greater depth dose of radiation delivered with preservation of the intervening tissues.

FIG. 22. Photographs of the patient on whom the first successful esophagectomy was performed by Torek, taken 12 days postoperatively.

TREATMENT OF ESOPHAGEAL TUMORS

The surgical attack upon the esophagus represents a major success because it invaded an organ hitherto inviolate to the scalpel. Biondi published results, in 1894, of experimental resection of the esophagus in animals. The first human esophagectomy with anastomosis was performed in 1907 by Wendel, but the patient succumbed. The classical case of Franz Torek, reported in 1913, represents the first successful resection of the esophagus for cancer. The technical details of the resection itself have been presently maintained, but the cumbersome method of repair described by Torek, consisting of an extracoelomic tube, left much to be desired and has been the object of numerous modifications and improvements.

In 1935 Churchill, in a review of esophageal surgery, termed it "the last frontier of surgery." Surgery of the esophagus at that time consisted of the removal of foreign bodies by esophagoscopy, bougienage for stricture and cardiospasm, excision of cervical esophageal diverticuli by staged procedures, and a few disappointing attempts at esophageal resection for carcinoma as performed by Torek in 1913.

Kirschner (1920) and Ohsawa and Seou (1930) independently resected carcinoma of the inferior esophagus through an abdominothoracic incision and effected an esophagogastrostomy by bringing the stomach into the thoracic cavity. By 1933, 13 successful cases had been reported.

In 1938, Adams and Phemister performed a partial esophagectomy and gastrectomy with primary esophagogastric anastomosis, after the technique of Ohsawa. With this improved technique for reconstructing the defect, additional attacks with extension of the resection were undertaken. John Garlock of Mt. Sinai Hospital, New York, was the first to perform the supraaortic intrathoracic anastomosis for midesophageal carcinoma (1944), but his patient died postoperatively. However, he had clinically demonstrated the height to which the stomach could be raised and this led to its being mobilized as high as the neck in later operations.

Circulation of the esophagus. The surgical maneuverability of the esophagus and the stomach depends upon the circulation of these organs. Shapiro and Robillard dissected 50 bodies to study the esophageal circulation and stated that it should be considered a shared vasculature, and that in dissecting it from the contiguous structures, such as the trachea, bronchi, and diaphragm, care must be taken lest segments be devascularized and thus mitigate against reconstruction. Potter and Holyoke studied the intrinsic blood supply and identified a submucous arterial plexus, confirming Poirier's observation of 1902. Swenson and Clatworthy (1947) demonstrated in dogs that extensive mobilization and excision of the esophagus was feasible, which suggested the adequacy of the intramural vascular anastomosis. Nissen calls attention to an important but little noted observation published by Kirschner in 1920 to the effect that sufficient blood supply to the stomach remained after all

the blood vessels on the left were ligated but the right gastric and right gastroepiploic arteries were preserved. This experiment, which demonstrated the degree to which the stomach could be mobilized, was not again clinically employed for almost a quarter of a century.

Credit goes to Richard H. Sweet for the first successful supraaortic anastomosis, performed in 1944. Garlock developed the intracervical esophagogastric anastomosis for higher esophageal carcinoma. The technique for cervical esophageal tumors is that of Wookey, described under the section on the head and neck.

Bricker, Burford, and Eiseman have commented on the Wookey procedure, claiming it is too conservative and that it would seem that a combined cervicothoracic resection with bilateral regional node dissection en bloc would be a better cancer operation. They describe such an operation carried out in stages and using a tubed pedicle graft for repair.

In 1877 Czerny first extirpated a cancer of the cervical esophagus by means of an incision along the left anterior border of the sternocleidomastoid muscle and then excision of the cancer; both stomas were left exposed, the inferior one being used for feeding purposes. The patient died 15 months later of recurrent cancer. Mikulicz performed a similar operation 7 years later but established continuity of the gullet by the use of a skin flap. His patient ate well until he died of recurrent cancer 16 months after the operation. Watson and Pool recorded that only 25 cervical esophagectomies had been done up to 1908, with an operative mortality of 48 per cent. From 1908 until the present date, numerous surgeons have utilized various techniques to resect the cervical esophagus. Von Hacker (1908) reported a successful resection of the cervical esophagus and larynx. In 1934 Evans reported a 23 year cure in a patient, and Trotter in 1937 recorded a 10 year cure. Watson (1942) reported a technique of treating esophageal carcinoma in the cervical segment by combined irradiation and surgery in 2 patients who are alive more than 10 years later.

Tumors of the upper fourth of the thoracic esophagus have been surgically inaccessible until recently (1948). They are too low for the Wookey operation (although Wookey has described operative procedures using contiguous skin for reconstructive purposes) and most frequently they are out of reach for reconstruction by a successful intrathoracic esophagogastrostomy. Sweet, in 1948, successfully overcame these defects by bringing the mobilized stomach into the neck and performing a cervical esophagogastrostomy. He resected the inner aspects of the clavicle and part of the first rib because he feared compression of the circulation in the narrow rigid inlet. Since then it has been shown that the bone resection is not necessary.

Other technical methods used to effect gastrointestinal continuity include the use of a jejunal limb in the manner of the Roux Y technique, the use of the transverse colon as described by Montenegro *et al.*, and a number of other modifications.

The technical difficulties of the operations on these upper thoracic esophageal cancers are reflected by the higher mortality. Sweet (1954) reported a mortality of 25 per cent of patients with supraaortic anastomoses in contrast to one of 7 per cent of patients with low thoracic anastomoses.

In view of the tendency of esophageal carcinoma to extend submucosally, frozen sections should always be taken from the edge of the resected specimen to make sure that the resection is beyond the extent of the cancer. Reoperation for recurrences have been successfully performed by Strieder (1948) and by Smithwick (1950).

The incidence of localized esophageal carcinoma studied at the time of autopsy shows marked variation. Fleming, in 1943, reported 19 per cent. Burke and Learn, in 1942, reported 28.6 per cent; Ochsner and deBakey in 1941, 40.7 per cent; and Watson in 1942, 48 per cent. These differences are difficult to explain, but the absence of distant metastases in certain series encourages the exploitation of all measures to eradicate a localized, but fatal, cancer.

Tracheostomy. The early performance of this procedure in a patient subjected to esophagectomy who has a stormy postoperative course represents a major accomplishment in the management of esophageal cancer.

The thoracoabdominal incision described by Ohsawa (1930), and used by Adams and Phemister in their resection, has been utilized by Sweet, Garlock, and many others for resecting cancer of the esophagus. Ivor Lewis of England (1946) has described a combined operation consisting of abdominal incision and separate right thoracic incision. Macmanus has developed this excision and it is now used com-

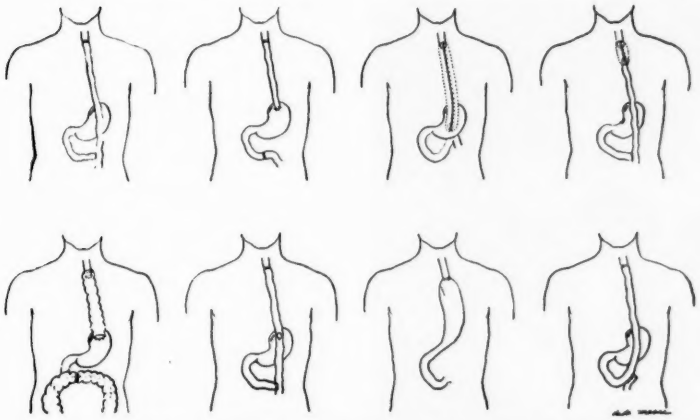


FIG. 23. Schematic drawing of various methods of intestinal and intestinocutaneous reconstructions. From left to right, top, esophagojejunostomy en Y, esophagojejunogastrostomy by isolated loop of jejunum (Roux), esophagogastrostomy using cutaneous tube (Bircher), and esophagojejunostomy en Y with partial skin tube (Wullstein); bottom, esophagocologastrostomy using isolated loop of transverse colon (Vulliet-Kelling), esophagogastrojejunostomy en Y (Herzen), antethoracoesophagogastrostomy, esophagogastrostomy en Y using proximal loop for subcutaneous esophagus. (T. R. Miller. In *Treatment of Cancer and Allied Diseases*, ed. 2. Paul B. Hoeber, Inc. In press)

monly for cancers of the middle and upper esophagus.

At present attempts are being made to use plastic prosthesis to effect reconstruction. Berman has utilized a polyethylene tube to bridge the defect following esophageal section. He claims good results, although Naclerio, who interrogated surgeons in New York who had utilized this procedure, observed leakage in 58 per cent of the patients and fatality in 8 per cent. These results simulate those obtained by Battersby and King who used this procedure experimentally in dogs. A more recent use of the plastic prosthesis is to insert it via an esophagotomy into the esophagus past an inoperable cancer to effect a lumen for the passage of food.

The attack upon esophageal cancer represents a milestone of surgical history. Cancers of this organ had hitherto been treated exclusively by irradiation with poor results. Unfortunately, many of the cancers are still discovered in advanced stages so that radiation therapy must still be utilized for treating them. In fact, the development of rotation x-ray therapy by Nielsen was primarily directed at treatment of the esophagus.

CANCER OF THE STOMACH

Cancer of the stomach is one of the most frequent cancers, accounting for roughly one-fourth of all fatal malignant neoplasms. Although this neoplasm was recognized by the ancients, it was not until the latter portion of the nineteenth century that effective methods for control were adopted. The recognition of the need for surgical extirpation of gastric cancer resulted in world-wide animal experimentation to ascertain if the stomach of a mammal could be removed and if the resultant state would be compatible with life.

The first gastric resection performed in a human being was done by a Frenchman, Jules Péan, in 1879: his patient died on the fifth postoperative day. Rydygier, in 1880, completed the second gastric resection, but his patient died within 12 hours.

The interest in gastric resection was high at the Billroth Clinic, and Billroth's pupils, Czerny and Kaiser, were simultaneously working upon the problem of gastric resection in animals. Billroth had long dreamed of being the first to effect the initial cure for gastric cancer, predicting in published reports 5 years before (August, 1877) he had actually performed

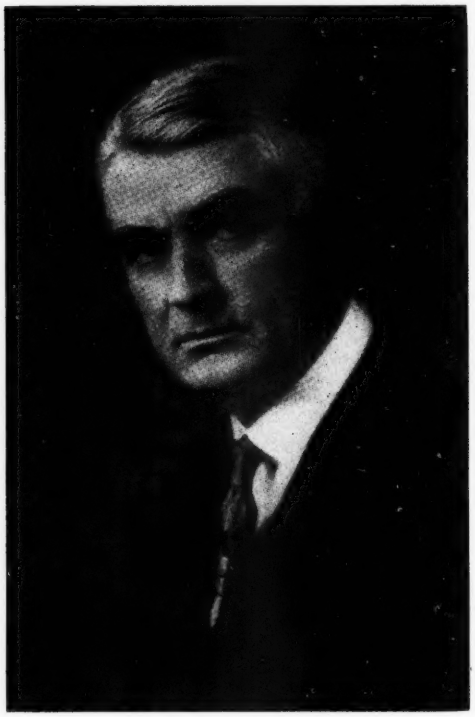


FIG. 24. William J. Mayo.

a gastrectomy that it was now ". . . a short step to removal of cancer of the stomach by surgical means." He stated there were now ". . . no unsurmountable obstacles to partial resection of the stomach, either on anatomical, physiological, or operative ground," concluding, "It must succeed."

The successful treatment of gastric cancer began on January 29, 1881, when Theodore Billroth performed the first successful human gastrectomy for carcinoma of the stomach. The resected specimen revealed the presence of three metastases to the adjacent lymph nodes and indicated the radical scope of his gastrectomy. The operation was completed apparently by a Billroth-I form of gastroenterostomy, the gastric stump being united to the duodenum by 33 silk sutures and the peritoneal cavity being closed without drainage. The operative procedure lasted 1.5 hours. The patient made an uneventful postoperative recovery but unfortunately died less than 4 months later from "cancerous degeneration of the peritoneum and infiltration of the retroperitoneal lymphatic glands." The next 2 patients on whom Billroth performed subtotal gastrectomies died postoperatively.

In 1885, just 4 years after the initial gastric resection, 37 gastric resections had been reported. William Welch, in an analysis of the published gastrectomies (which is referred to as "the classical study of Welch") indicated that of these first 37 resections, 27 had resulted in operative deaths, while 10 were followed by survivals of varying periods. The 37 operations had been performed by 25 different surgeons, Billroth performing 8, and his associates, Czerny and Wölfler, 4 and 1, respectively. The additional operations were performed by individual surgeons, each reporting 1 operation. Welch concluded, "There is no proof that cancer of the stomach has ever ended in recovery," and "We have no sufficient evidence to believe that cancer of the stomach has ever been completely destroyed by any process of nature or by any treatment."

The six reasons that Welch gave to show that gastrectomy was not applicable to the average patient with gastric cancer are: (1) the distant metastases present when the patient is first seen, (2) the location of the cancer within the stomach (cardia), (3) the extent of the cancer within the stomach (linitis plastica), (4) widespread extension to the neighboring organs, such as the pancreas and colon, (5) the debility of the patients, and (6) the absence of sufficiently skilled surgeons.

With the exception of the first reason, each of the others had been either partially or completely overcome by the advances within the past 50 years.

At the turn of the century, the results with regard to curing gastric cancer were still hopelessly poor. Friedenwald, in 1914, reported upon 1,000 cases of gastric cancer culled from the surgical literature; in 266 exploratory laparotomy was done and in only 9 could resection be performed successfully. Only 1 of the 1,000 patients survived for 1.5 years; all of the others died of gastric cancer. Thus, not 1 patient in 100 was subjected to gastrectomy, and only 1 in 1,000 lived as long as 1.5 years during the quarter century subsequent to the initial gastrectomy. These values more or less confirm Billroth's initial pessimism when he estimated that only 1 of 200 cancers would be resectable.

In 1915, Bloodgood reported the experience at Johns Hopkins Hospital from 1889 to 1915, and revealed the amazing fact that only 3 patients with gastric cancer were known to have survived for 5 years; also, that of all the patients admitted, 99 per cent remained uncured, and only 30 gastric resections had been performed during the entire 25 years in this surgical center, the seat of Halsted's activities. The figures, however, indicate that a 10 per cent cure rate was possible in patients subjected to gastric resection. In 1917, Peck reported the end results in gastric cancer from a number of the larger hospitals of New York City. Of 527 patients with gastric cancer, 408 were subjected to operative procedures; 98 had resections, but 26 died postoperatively (a mortality of 28 per cent). One hundred and sixty-seven palliative gastroenterostomies or some other palliative operations were performed. Eight patients were known to be alive 3 years after operation (12 per cent of those on whom resection had been performed). Thus, in a span of 36 years from the first gastrectomy, the resectability rate had improved to 1 in every 6 operated upon, a significant improvement over the original estimate of Billroth that not more than 1 in 200 would prove resectable.

The Mayos mastered the technique of gastric resection for cancer of the stomach and by their enthusiastic attitude and low mortality rate during the beginning of the century kept alive the interest in the surgical treatment of this disease, but throughout the subsequent years, the picture for the patient with gastric cancer continued to be dismal. Maes, in 1933, reporting from clinics in New Orleans, reported that not 1 patient in 200 with gastric cancer survived the 2 year limit. Of 758 patients, 35 had gastric resection, with a mortality rate of 51.4 per cent. In the period from 1926 to 1931, St. John of Presbyterian Hospital in New York reported that only 2 per cent of the patients admitted to that institution for cancer of the stomach, were alive at the end of 5 years. One patient in 7 was treated by gastric resection, and the mortality was 43.7 per cent. Oughterson, of the Yale Medical School in New Haven, reported but 19 resections in a 10 year span, with an operative mortality of 52.6 per cent. Saltzstein and Sandweiss reported, from Detroit, a mortality of 61 per cent; only 3 per cent of all patients with gastric cancer were operated upon.

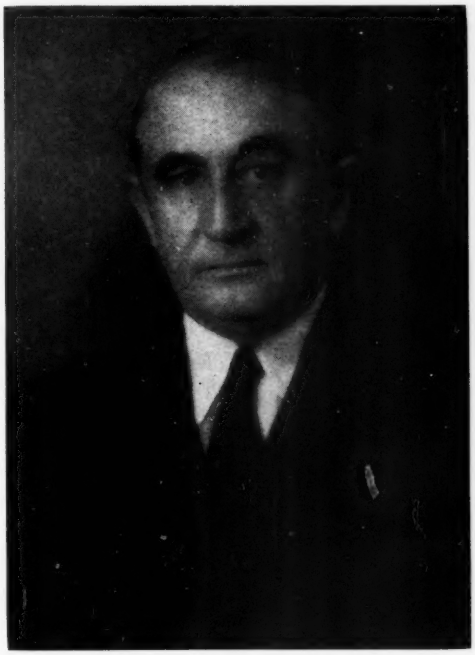


FIG. 25. Charles H. Mayo.

Reports covering approximately 3,000 partial gastrectomies for cancer from the time of Billroth (1881) to 1910 showed a remarkable range of published resection mortality rates, from 7 to 70 per cent in all patients observed. The high mortality attendant upon gastric resection, in the vicinity of 50 per cent, was probably responsible for the timidity with which certain surgeons attacked this problem. These values of high mortality and low resectability rate prevailed until 1940, when substantial advances permitted the performance of gastrectomy with the present mortality varying from 1 to 5 per cent and a resectability rate of 70 to 80 per cent. The absolute cure rate, however, continues rather low, varying from 10 to 20 per cent despite the improvements resulting in postoperative survival and larger numbers of patients being subjected to the operation.

The greatest deterrent in effecting cures for cancer of the stomach resides in the fact that approximately 75 per cent of the patients subjected to gastrectomy have metastases to the regional lymph nodes. This emphasizes the need for an earlier diagnosis if a cure is to be made,

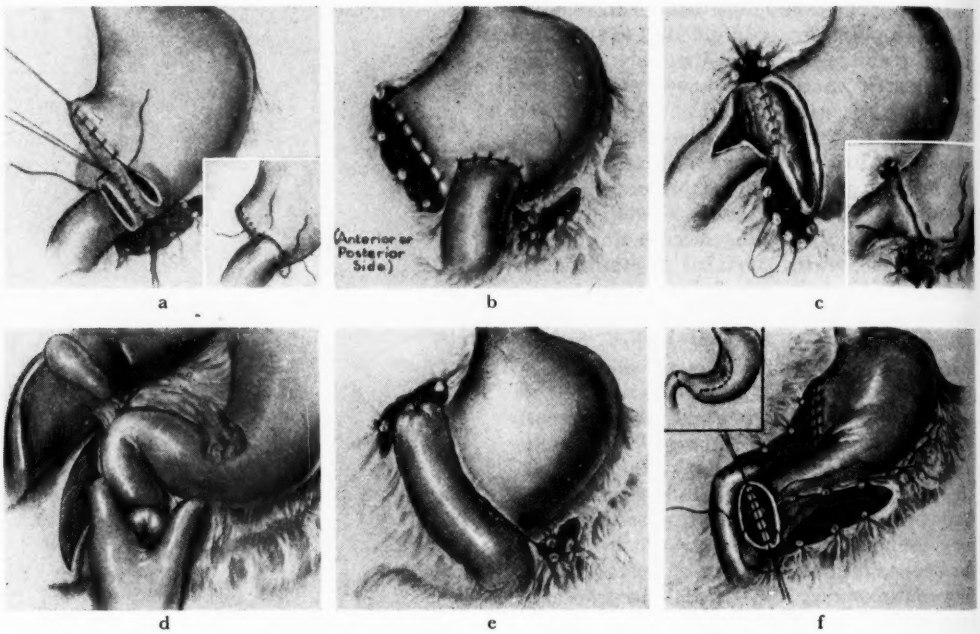


FIG. 26. Gastroduodenal anastomoses. Reconstructions on the Billroth-I principle. a, Billroth-I technique, 1881 (end-to-end union); b, Kocher technique (obsolete), 1895 (side-to-end union); c, Morison-Horsley technique, 1905 and 1926 (end-to-end with flaring duodenum); d and e, The Haberer-Finney technique, 1922 (mobilizing duodenum); 1923 (end-to-side union); f, Schoemaker technique, 1929 (tubular end-to-side union). (In *Treatment of Cancer and Allied Diseases*. ed. 1. Paul B. Hoeber, Inc., 1940.)

and possibly more radical extirpation in patients with gastric cancer.

Little is known concerning the etiology of gastric cancer (although many theories exist), and an understanding of the nature of gastric cancer is further inhibited by the fact that it is almost an impossibility to produce adenocarcinoma in the stomachs of animals (squamous carcinoma in the forestomach of animals has been produced by any number of carcinogens). Fibiger was awarded the Nobel prize in 1913 for his demonstration of a supposed relationship of Gonylonema neoplasticum to gastric cancer of the rat; others, such as Passey, Leese, and Knox, in 1935 indicated that the results obtained by Fibiger may have been related to a dietary deficiency of vitamin A, rather than to the parasitic rat roach.

The relationship of gastric anacidity and cancer has been recognized since 1897 (Ewald). In 1892 Boas suggested that lactic acid in the gastric juice was a pathognomonic sign; he also placed emphasis on the presence of blood in the stomach contents and suggested that a strain of bacteria (the Oppler-Boas bacillus) within the gastric juice was indicative of gastric cancer. These diagnostic methods have been largely displaced by accurate x-ray study. The achlorhydria of pernicious anemia with atrophy of the gastric wall has caused Kaplan and Rigler (1945) to state that the predisposition of patients with pernicious anemia to develop cancer is three times greater than that of normal individuals. Patients with achlorhydria without pernicious anemia also had a higher tendency to develop gastric polyps. Gastritis has not been shown to be a feature of importance in the production of gastric cancer. The relationship of peptic ulcer to gastric cancer is one which has plagued surgeons. Although at one time it was generally believed that gastric ulcers would degenerate into gastric cancers, this opinion is now not accepted; however, the fact that approximately 20 per cent of the patients operated upon for gastric ulcer reveal cancer within the ulceration is a strong in-

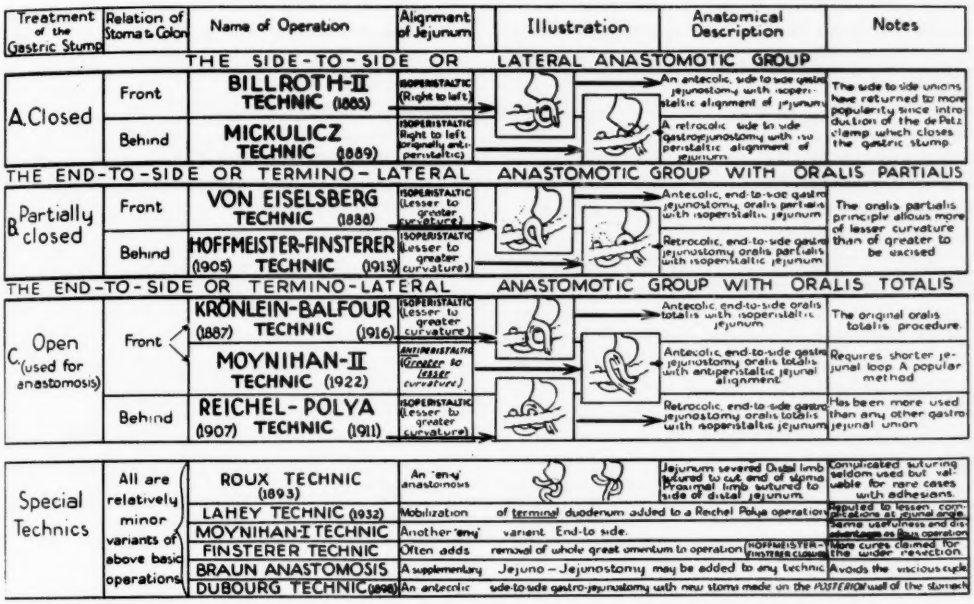

Treatment of the Gastric Stump
Relation of Stoma to Colon
Name of Operation
Alignment of Jejunum
Illustration
Anatomical Description
Notes
THE SIDE-TO-SIDE OR LATERAL ANASTOMOTIC GROUP
A. Closed
Front
BILLROTH-II TECHNIC (1885)
ISOPERISTALTIC (Right to left)
An antecolic, side to side gastro jejunostomy with isoperistaltic alignment of jejunum
The side to side unions have returned to more popularity since introduction of the de Petz clamp which closes the gastric stump
Behind
MICKULICZ TECHNIC (1889)
ISOPERISTALTIC Right to left or rarely anti-peristaltic
A retrocolic side to side gastrojejunostomy with iso peristaltic alignment of jejunum
THE END-TO-SIDE OR TERMINO-LATERAL ANASTOMOTIC GROUP WITH ORALIS PARTIALIS
B. Partially closed
Front
VON EISELSBERG TECHNIC (1888)
ISOPERISTALTIC (Lesser to greater curvature)
Antecolic, end-to-side gastro jejunostomy, oralis partialis with isoperistaltic jejunum
The oralis partialis principle allows more of lesser curvature than of greater to be excised
Behind
HOFFMEISTER-FINSTERER (1905) TECHNIC (1913)
ISOPERISTALTIC (Lesser to greater curvature)
Retrocolic, end-to-side gastro jejunostomy oralis partialis with isoperistaltic jejunum
THE END-TO-SIDE OR TERMINO-LATERAL ANASTOMOTIC GROUP WITH ORALIS TOTALIS
C. Open (used for anastomosis)
Front
KRÖNLEIN-BALFOUR (1887) TECHNIC (1916)
ISOPERISTALTIC (Lesser to greater curvature)
Antecolic end-to-side oralis totalis with isoperistaltic jejunum
The original oralis totalis procedure
MOYNIHAN-II TECHNIC (1922)
ANTIPERISTALTIC (Greater to lesser curvature)
Antecolic, end-to-side gastro jejunostomy oralis totalis with antiperistaltic jejunal alignment
Requires shorter jejunal loop A popular method
Behind
REICHEL-POLYA (1907) TECHNIC (1911)
ISOPERISTALTIC (Lesser to greater curvature)
Retrocolic, end-to-side gastro jejunostomy oralis totalis with isoperistaltic jejunum
Has been more used than any other gastro jejunal union
Special Technics
All are relatively minor variants of above basic operations
ROUX TECHNIC (1893)
An 'any' anastomosis
Jejunum severed Distal limb sutured to cut end of stoma Proximal limb sutured to side of distal jejunum
Complicated suturing seldom used but valuable for rare cases with adhesions
LAHEY TECHNIC (1932)
Mobilization of terminal duodenum added to a Reichel Polya operation
Reputed to lessen complications at jejunal angle
MOYNIHAN-I TECHNIC
Another 'any' varient End-to side.
Same usefulness and disadvantages as Billroth operation
FINSTERER TECHNIC
Often adds removal of whole great omentum to operation (HOFFMEISTER-FINSTERER CLOSURE)
More curves claimed for the wider resection
BRAUN ANASTOMOSIS
A supplementary Jejuno – Jejunostomy may be added to any technic
Avoids the vicious cycle
DUBOURG TECHNIC (1908)
An antecolic side-to-side gastro-jejunostomy with new stoma made on the POSTERIOR wall of the stomach

FIG. 27. Gastrojejunal anastomoses. Reconstructions on the Billroth-II principle. "Choose a technique for repair only when the cancer has been excised. Optional methods for reconstruction are so numerous as to ensure safe anastomosis after the performance of a gastrectomy of any extent."

(In *Treatment of Cancer and Allied Diseases*. ed. 1. Paul B. Hoeber, Inc.)

dication for the operative treatment of gastric ulcers if they do not heal rapidly on a medical regime (Finsterer, 1939; Allen and Welch, 1941; Marshall and Welch, 1948).

Although the tendency of gastric polyps to become malignant is less than that of polyps of the large bowel, nevertheless, such a tendency does exist. In a study by Hay (1949) at the University of Minnesota, 89 polyps were observed; 39 were resected and in 7, cancers were found. Hay stated that polyps more than 2 cm. in diameter are almost invariably malignant, and of all the polyps resected, 22.5 per cent were cancerous.

The other important aids in the diagnosis of gastric cancer are gastric roentgenology, first used by Pfahler in this country in 1911, and the re-introduction of the gastroscope by Schindler in 1923, the first gastroscope having been described in 1881 by Mikulicz.

Cancer of the Gastric Cardia

Cancer of this segment of the stomach was at one time considered outside the surgical domain and was so classified by Welch in 1885. Its treatment presents certain special techniques. Von Mikulicz determined that the abdominal esophagus could be operated upon without an ensuing tension pneumothorax, and he was the first to report a gastric cardiectomy (1898), but his patient died. The first successful cardiectomy was performed by Voelcker in 1908; his patient was alive 3 years later.

Von Mikulicz (1904) and Sauerbruch (1906) originated the transpleural thoracotomy by showing that the thorax could be invaded safely under differential pressure. Their patients succumbed, however, as did the patients of other surgeons utilizing the transthoracic route. Peritonitis usually caused death in patients resected by the transperitoneal method, and shock in those operated upon by the transpleural approach. The first operative survivals by any single stage transpleural gastric cardiectomy were reported by Brun (1916) and Bircher (1918).

In 1923, Hörhammer reported a patient living 6.5 years after a transabdominal cardiectomy for cancer of the proximal segment. Heuer, Andrus, and Bell (1925) planned and successfully

carried out in dogs an operation whereby the left leaf of the diaphragm was transplanted high in the chest and subsequently an esophagogastrectomy with anastomosis below the diaphragm was performed. The 1 patient upon whom the operation was attempted died.

Sauerbruch (1925) again unsuccessfully performed a transthoracic, transdiaphragmatic resection of the gastric cardia with esophagogastrostomy in one stage, but insisted that it could be done successfully. Marshall introduced the operation in the United States, and performed the first successful transthoracic cardiectomy in 1937. Adams and Phemister, and Cattell, in 1938, were also successful in performing this operation. Garlock, with wide experience and perseverance in the use of the transthoracic approach, popularized the operation in the United States.

Schwers (1914) described a transpleural and transdiaphragmatic resection in two stages with rib resection. A U-shaped incision was made on the left edge of the sternum, beginning at the base of the middle and lower thirds and proceeding over the costal arch. Extrapleural resection of the ninth to fifth ribs, inclusive, was done and the pleural cavity opened at the level of the fifth rib. The esophageal stump was isolated, and this was followed by isolation of the cardia with preservation of the vagi. A direct anastomosis was performed after resection of the cardia and esophagus.

The transpleural approach in the three or four-stage operation was successfully performed by Zaaijer (1913). The first stage consisted of a laparotomy and gastrostomy. The second stage was a subperiosteal resection of the left sixth to eighth ribs. In the third stage a transpleural and transdiaphragmatic resection of the cardia was performed, the esophageal stump being brought out through the lower axilla. The fourth stage consisted of union of the two stomas with rubber tubing.

The technical features of the anastomosis have been developed since Miyagi (1927) stated categorically that no operator had ever succeeded in obtaining a good result by a direct suture of the esophagus to the stomach or jejunum. Clairmont asserted that if the defect after removal of the esophagus and cardia is longer than 8 cm., a direct anastomosis would not be possible. Ohsawa and Raven recommended that the anastomosis be covered with omentum to afford protection against leakage. Borches and Bircher attempted to cover the site with a peritoneal reflection freed from the diaphragm. Kümmell, Brun, Bircher, Küttner, and Clairmont completely divided the esophagus before starting the anastomosis, but Voelcker and Miyagi began the anastomosis before severance in order to eliminate the use of clamps on the delicate esophagus.

The invagination method of anastomosis, described by Sauerbruch, Miyagi, Kader, Bircher, and Carter, involved the insertion of the distal esophageal stump into a carefully measured rent in the anterior wall of the gastric remnant and traction downward by means of a clamp inserted into the gastric lumen distal to the site of the anastomosis. It was then sutured in place.

Many incisions for cardiectomy have been utilized. The abdominal cavity has been opened in a great variety of ways by angle and transverse incisions. The costal arch incision, first suggested by Bozzi and later used by Hans Brun, proceeded from the ensiform cartilage parallel to the costal margin up to the thirteenth rib. Marwedel made a curved incision 2 finger-breadths below the costal arch and parallel to it, extending from the ensiform process to the tenth rib. In the medial angle of the wound the seventh rib, and at the lateral angle the seventh, eighth, and ninth ribs were divided after bluntly stripping off the rectus and the external oblique muscles. The thoracic flap mobilized in this way could be conveniently closed above, and offered a moderately satisfactory approach to the cardia and abdominal segment of the esophagus. The Baudet-Navarro exposure is somewhat similar; it permits the elevation of a costochondral flap which is later resutured into place. Voelcker (1908) opened the abdomen first by a median longitudinal incision from the ensiform process downward for 8 to 10 cm. and thus established the resectability of the cancer. Then the incision was continued at an angle and parallel to the costal arch up to the left anterior axillary line. The sixth and seventh ribs in their cartilaginous portion, and the seventh, eighth, and ninth ribs were divided subperiosteally. This procedure is similar to that of Marwedel and offers a good approach to the gastric cardia. The combined thoracoabdominal incision is now most frequently employed.

The Extended Gastrectomy for Cancer

A knowledge of some of the causes for past failures offers indices for extending the limits of

gastric resection. Various problems exist pertaining to the scope of the operation. Lahey, Scott and Longmire, de Amesti, Meyer *et al.*, and others advocate total gastrectomy for gastric cancers as it fulfills the requirements of a cancer operation. In time this operation may be done routinely, but the severe dietary crippling and physiologic abnormalities which result from it have discouraged certain surgeons from routinely performing it. It should be performed for primary gastric lymphosarcoma, linitis plastica, and the superficially spreading form of gastric cancer. The en bloc dissection of Allison (1949), consisting of splenectomy and partial pancreatectomy to include as many regional lymph nodes as possible, is now being routinely practiced in certain clinics. Cancers which have extended to contiguous organs such as the colon, liver, and other adjacent structures can be resected en masse by present day techniques.

Total Gastrectomy

In 1898 Kroenlein conceived "total gastrectomy" to be the most definitive operation for gastric cancer. The first known total gastrectomy in man was done by Conner of Cincinnati in 1884; his patient died of shock on the operating table. The credit for the first successful performance of this operation should go to Schlatter of Switzerland, who in 1897 effected an esophagojejunostomy in a woman aged 56 years. She died 1 year and 53 days later of recurrent carcinoma. Even at that early date in the evolution of the operation, the surgeons who attempted it were cognizant of the operative complications and occasional metabolic disturbances that accompanied it. The second and third successful total ablations of the stomach were performed by the American surgeons, Brigham and Richardson, in 1898. Brigham carefully studied the 2 years of postoperative life granted his patient and made the original observation that hematopoiesis was retarded after complete removal of the stomach. This conclusion was strengthened by the experience of Moynihan, who in 1907 reported the case of a 43 year old male who died 3 years and 8 months after total gastrectomy and esophageal anastomosis. At postmortem examination a profound anemia was discovered, a fact which greatly impressed this able surgeon.

At the beginning of the twentieth century the Murphy button was frequently employed in all forms of gastrointestinal anastomosis. Four of every 5 patients in whom the method was used for esophagojejunal and esophagoduodenal anastomoses died of peritonitis. In 2 early cases a calcified bone bobbin was used with success.

MacDonald, who performed the fourth successful operation of this kind in 1898, made note of a distressing diarrhea of which his patient complained. Little attention was paid to this phenomenon until Flint in 1928 described the light, liquid stools which indicate a deficiency in fat digestion. Frequent reference to a hearty return of appetite has been described throughout the entire history of the performance of this operation. That total gastrectomy was not inconsistent with the enjoyment of good food was attested to by a patient of Harvie, who in 1900, 6 weeks after such an operation, declared that he dined happily on roast beef and mashed potatoes.

The first long term survival was reported by Dollinger, who in 1901 removed the entire stomach of a policeman. This patient was living and well, being employed at his usual occupation at the time of the report, 4 years and 9 months after his operation. Patients are now living more than 10 years following total gastrectomy, although many of them have persistent dumping syndromes and metabolic deficiencies.

In 1943, approximately 300 total gastrectomies had been performed. Up to 1952, 185 had been done at the Mayo Clinic. By 1954, 220 had been performed at the Memorial Cancer Center in New York. Various techniques of establishing digestive tract continuity have been developed. Exposure by the thoracoabdominal route, as described by Kirschner (1920) and developed by Ohsawa (1930) and Garlock (1946), has been used extensively in recent years. The degree of physiologic imbalance after this operation has been stressed. There is rapid glucose absorption leading to hyperglycemia. Iron and fat absorption are faulty. A macrocytic anemia often develops in patients who survive 3 or more years. The "dumping syndrome" is bothersome.

The mortality from total gastrectomy has steadily declined. Prior to 1921 it was 49.3 per cent, but from 1921 to 1930 it was reduced to 31.6 per cent. The operative mortality is now in the neighborhood of 10 per cent (Lahey—1950, Scott and Longmire—1949).

The Second Look of Wangensteen

Wangensteen believes in "postoperative reoperation" in patients whose visceral cancer shows

evidence of metastases to lymph nodes and who, according to the statistics, have but a small chance for survival. He has subjected these patients to reoperation during the "silent period of their recurrence" and has often encountered recurrent cancer. Although the salvage rates are not materially increased for patients with gastric cancer, this bold surgical experiment is contributing greatly to a better understanding of the natural history of gastric cancer, and some lives are being salvaged, especially for cancers of the lower gastrointestinal tract.

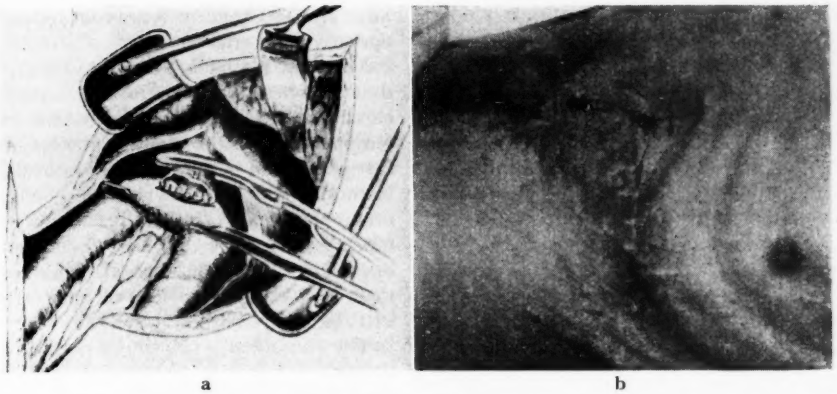
Treatment of Cancer of the Colon

The treatment of colon cancer by exteriorization was inaugurated in 1903 when Mikulicz described a method of mobilizing the bowel by dividing the mesentery to include the regional lymph nodes and bring the loop through the wound, close the abdominal wall, and then remove the growth about 12 to 48 hours later. He decompressed the proximal bowel segment. This operation was developed following a series of surgical observations. When Travers in 1812 first showed that healing of the intestines will occur through agglutination of the serosal surfaces, the practice of intestinal anastomosis was introduced. In 1826, Lembert described his method of intestinal suture. In 1892, two important contributions relevant to cancer of the colon were made. One was the anastomosis button, developed by John B. Murphy. The other was developed by Bloch in Denmark. Discouraged by the high mortality (50 per cent) following primary bowel resection, he conceived an operation in which the actual resection of the bowel was done outside of the abdominal cavity. This type of exteriorization operation was performed also by Paul, surgeon to the Liverpool Infirmary. When 5 of 7 patients on whom Paul attempted colonic resection died postoperatively, he conceived the idea of exteriorization. He states, "There remained, however, to be tried the old plan of restoring continuity by Dupuytren's enterotome, to which very little risk is attached. If such a method could be perfectly successful when the spur was accidentally formed by nature, how much more ought it to be so when a spur was deliberately constructed with the object of being subsequently safely removed? I have therefore brought out and determined to put in practice the following method of operating in the next case: first, excise the strictured portion of the bowel as in the last two cases; then suture together the cut edges of the mesentery and the adjacent sides of the two ends of the colon, in such a manner that they will adhere together for about three inches in the position of two barrels of a double barreled gun. If this succeeded, the spur might be demolished without the slightest risk of peritonitis and to such an extent as to insure a free passage and easy closing of the artificial anus." The next case was done by this method and was successful. His final conclusion was as follows: "When the patient is in good condition, the abdomen not distended, the tumor small, and the proximal end of the bowel not generally hypertrophied, I advise immediate approximation by Murphy's button method. But when the opposite of these conditions prevails, I strongly urge that the ends of the bowel should be brought out in the manner explained and illustrated; I feel sure that I have been unfortunate in the sort of cases I have had to deal with, and that this method of bringing out the ends is much safer than any other plan of immediate approximation, all statistics notwithstanding."

The initial studies of the lymphatic drainage of the colon by Jamieson and Dobson in 1909 called attention to the first line of lymphatic defense, the paracolic nodes, located along the arcade on either side of the tumor and draining into the intermediate nodes, and upon the amount of tissue that should be removed during a resection of the colon. The recent studies of Gilchrist and David and Coller, Kay and MacIntyre on the lymphatics of the sigmoid and rectum give data concerning the extent of resection which must be accomplished for rectal cancers, and this data can be interpolated to all colonic cancer.

Rankin, in his article on obstructive resection, published in 1930, discussed the status of intraabdominal anastomosis up to that time and indicated that a method of lowering the mortality was the "obstructive resection." This operation included the segment of bowel necessary for a cancer resection, and also its lymphatic drainage.

However, the frequent wound recurrences and the long period of disability due to exteriorizing operations caused surgeons to perfect the intraabdominal anastomosis. The importance of proximal decompression was accepted as a necessary procedure by most surgeons (Jones, Rankin, and Bevan) and reached the highest development



a b

FIG. 28. a, An esophagojejunostomy following total gastrectomy through a thoracoabdominal incision; b, the thoracoabdominal incision used by Ohsawa.

by the use of Wangensteen's suction applied to a Miller-Abbott tube. As early as 1891 Paul did a right lumbar colostomy as a preliminary procedure in a patient with acute obstruction.

Methods of performing the actual anastomosis concerned surgeons throughout the century. In 1899, Connell reported at least 120 methods of intestinal suturing. In 1908, Parker and Kerr described 80 more, and they reported the so-called aseptic technique using the basting stitch. In 1923, Kerr reported that at least 250 methods of intestinal anastomosis had been recorded. Stone and McLanahan, in 1939, stressed the importance of closed anastomosis. Wangensteen is also an advocate of closed aseptic anastomosis. The advent of the sulfa drugs, which rendered anastomosis safer, has enabled most surgeons to employ the open technique with relative safety.

Many surgeons, including Cattell, Klein, and Garlock, and others, advocate a proximal vent when they perform a colonic anastomosis.

The Treatment of Colonic and Rectal Polyps

That colonic polyps are cancer precursors make it essential to classify, identify, and treat them before they have had an opportunity to undergo malignant change. Classifications have been presented by Fitzgibbon (1930), Buie (1938), and Dukes (repeated studies). There is probably no benign process in which there is a higher incidence of malignancy than in colonic polyps. Lockhart-Mummery states, "Almost all recorded cases of multiple polypi of the colon eventually become malignant." In a certain type in which the entire colon is involved, the tumor is of a hereditary, familial nature, being transmitted as a Mendelian dominant. The incidence of polyps varies from 2 to 21 per cent, and the distal colon and rectum are most frequently involved. Cancer detection centers are discovering the true incidence of asymptomatic polyps. Various methods of treatment have been utilized throughout the years. In 1930 Barker and in 1936 McKenney advocated deep x-ray therapy; this procedure has fortunately been abandoned. Fulguration of the polyps that can be reached by the sigmoidoscope is a suitable method of treatment. Various surgical procedures have been advocated. In one procedure, it has been stated, divergence of the fecal stream by the use of ileostomy and colostomy has occasionally been followed by the disappearance of tumors in the part of the bowel put at rest, but this procedure is unsatisfactory and unreliable. Local excision of polyps has been practiced by Rankin, and resection of that portion of the bowel in which the tumor was located was performed by Dixon in 1935, and by Cattell and Swinton in 1937. When the entire colon is involved, the best treatment is a total colectomy and an ileosigmoidostomy. This was advocated in 1930 by Rankin and again in 1931 by Kennedy and Weber. Between 1930 and 1948, Hoxworth and Slaughter reviewed only 28 cases in which a total or subtotal colectomy had been performed. Dye *et al.* (1951) reported 11 cases of familial polyposis which were treated by colectomies. Approximately 115 colectomies for diffuse polyposis are recorded in the literature.

Multiple colonic cancers. Behrend and Stein (1951), Rankin and Conger (1951), Thomas, Dockerty, and Waugh (1948), and others have called attention to the frequency with which either multiple carcinomas or multiple polyps and a single carcinoma may exist synchronously within the large bowel. A technique which is frequently helpful in identifying the presence of intraluminal tumefactions not visible on roentgenographic examination is a colotomy at strategic sites during an operation for a known cancer and examination with the proctoscope to inspect the entire colon visually.

Treatment of Cancer of the Rectum and Rectosigmoid

The story of progress in the cure of cancer of the rectum and rectosigmoid constitutes one of the most interesting and encouraging chapters in the entire realm of cancer therapy.

Rectal cancer. Paget performed the first resection of the rectum in 1739, but his patient died postoperatively. Lisfranc reported the first successful resection of the rectum for cancer in 1833. This operation was a perineal excision without opening of the peritoneum. The mortality rate was high during the first part of the nineteenth century, and in "The System of Surgery," edited by Timothy Holmes, 1864, an article on diseases of the rectum by H. Smith reads as follows: "Some surgeons were a few years since in the habit of performing excision of the lower part of the rectum when affected with cancer; but this proceeding must be looked upon both as barbarous and unscientific and it is now happily exploded from the catalogue of surgical operations."

In 1877, Harrison Cripps, surgeon to St. Bartholomew's Hospital, was awarded the Jacksonian prize for an essay entitled, "The Possibility of Cure or Relief of Cancer of the Rectum by Excision." He popularized the operation despite the fact that Sir James Paget, considered the great authority on cancer, stated: "The number of cases in which cancer does not recur after operation is not one in 500."

Paul Kraske, Professor of Surgery at Freiburg, in 1885 described an operation whereby a portion of the coccyx and sacrum were removed to permit higher access to the rectum and a "sacral anus" was produced. Various modifications of Kraske's operation soon followed. Larger portions of the sacrum were removed, or bone flaps were formed. Numerous names, such as Bardenheur and Hochenegg, are associated with these operative procedures.

Miles, in his book "Rectal Surgery," stated that the operation of perineal excision of rectal carcinoma was of a restricted nature. In his attempt to extend the scope of the operation, he first performed more and more radical perineal resections and then devised the combined abdominoperineal resection. Because of the high mortality rate from the Miles abdominoperineal operation during this period, Lockhart-Mummery evolved the "perineal method of excision" in 1914 and published it in 1920.

The combined synchronous perineal and abdominal operation was early described and is still used by some, although this operation was discarded by the Mayo brothers as early as 1911.

Changing rates of curability: the status praesens. The French Surgical Congress, in 1925, held a symposium on this subject of "End Results in the Treatment of Rectal Cancer" which summarized accomplishments to that date through the study of records which constituted an enormous experience. Twenty-four hundred cases were subjected to analysis of the "low" or extra-abdominal method of operation, as recorded since 1900.

Herein is revealed that the 3 year cures from the perineal approach (the most common method prior to 1910) amounted to an average of 13 per cent. Definitive cures for this length of time following the coccygeal route (next in popularity) amounted to 24 per cent; and resultant cures with the sacral approach (first proposed by Kraske and gradually gaining in popularity until it dominated the operative procedures for the period under survey in this symposium) reached the average level of 32 per cent. The mortality of all three methods was then in the neighborhood of 20 per cent immediate operative deaths.

The conclusions, findings, and figures of this Congress should be compared with certain reported end results of the present, in which the operative mortality ranges from 2 to 8 per cent and the reported 5 year cure rates range from 52 to 92 per cent.

TABLE I

	Palliation	*Perineal*	*Coccygeal*	*Sacral*
Operative deaths (5).	17	20	16	17.4
Three year cures....	5.3	13	24	32
Five year cures.....	3.3	5	7	26
Ten year cures.....	1	3	3	10.5

Could any surgical condition show a more steady, sustained, and impressive rise in results and lowering of risks than demonstrated in this progression from perineal to coccygeal, to sacral, to abdominoperineal attack upon rectal and rectosigmoid cancers? It is upon the basis of these figures that the statements were made, in summarizing the "hopeful nature" of this form of cancer, that: "Beginning with but 10 per cent definitive cures during the initial decade of the present century there has been an advance of 100 per cent in attained end results for each decade to the present," and that for the abdominoperineal operation there have occurred within recent years "reductions of 200 per cent and 500 per cent in the operative mortality for these major procedures," and, still again, that "as recently as 1920 the best reported rates of operability were not one-half those reported today among those performing operations in large numbers (30 per cent minus, then; 60 per cent, plus, now)." During the subsequent 30 years, increased knowledge regarding this form of cancer resulted in the development of more radical operative procedures.

Anatomic studies regarding the spread of rectal cancers. In 1908, when Miles first performed his abdominoperineal resection, he did so because he was disappointed with the high recurrence rate resulting from the usual perineal resection. He utilized resected specimens for study and in 1920 and again in 1931 concluded from clinical and histologic studies that intramural spread is quite rare.

However, the question concerning the extent of spread of the cancer in the colon or rectum has been subjected to numerous studies and controversial findings. Clogg in 1904, Cripps in 1912, Cole in 1913, Westhues in 1934, and Gordon-Watson in 1938 claimed there was no significant intramural spread either distal or retrograde in the rectum or colon. Contrary findings were claimed by Handley in 1910 and by Connel and Rottino in 1949, who reported finding significant retrograde intramural spread in 4 of 9 patients studied by a modified serial section technique. In 1953 a careful study performed by Quer, Dahlin, and Mayo of the Mayo Clinic failed to find a significant retrograde spread within the tumor. These authors state that a margin of 2½ cm. of grossly uninvolved intestinal wall below the lowest grossly palpable, visible end of the carcinoma is sufficient for Broders' grades I and II, and that for Broders' grades III and IV a margin of at least 6 cm. be allowed, and that if this cannot be done, hope for effecting a cure by an anterior resection and anastomosis should be abandoned.

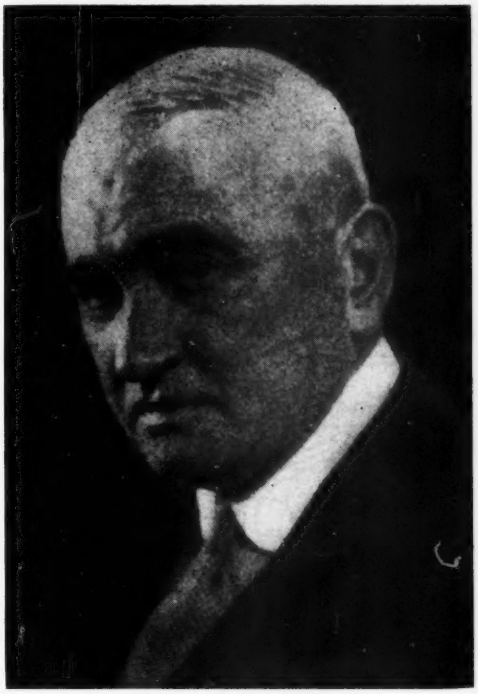


FIG. 29. a, W. Ernest Miles.

A METHOD OF PERFORMING ABDOMINO-PERINEAL EXCISION FOR CARCINOMA OF THE RECTUM AND OF THE TERMINAL PORTION OF THE PELVIC COLON.

BY W. ERNEST MILES, F.R.C.S. ENG., L.R.C.P. LOND., SURGEON TO THE CANCER HOSPITAL, BROMPTON, S.W., AND TO THE GORDON HOSPITAL FOR DISEASES OF THE RECTUM, VAUXHALL BRIDGE ROAD, S.W.

FIG. 29. b, Title of original paper by Miles, appearing in *Lancet*, Lond., Dec. 19, 1908.

Studies of the routes and incidence of spread of rectal cancer were performed by Gilchrist and David in 1938, and by Grinnell in 1950. The latter author called attention to the fact that metastases very seldom occur unless a tumor has invaded the muscle wall. The muscle wall apparently plays an important part in delaying the

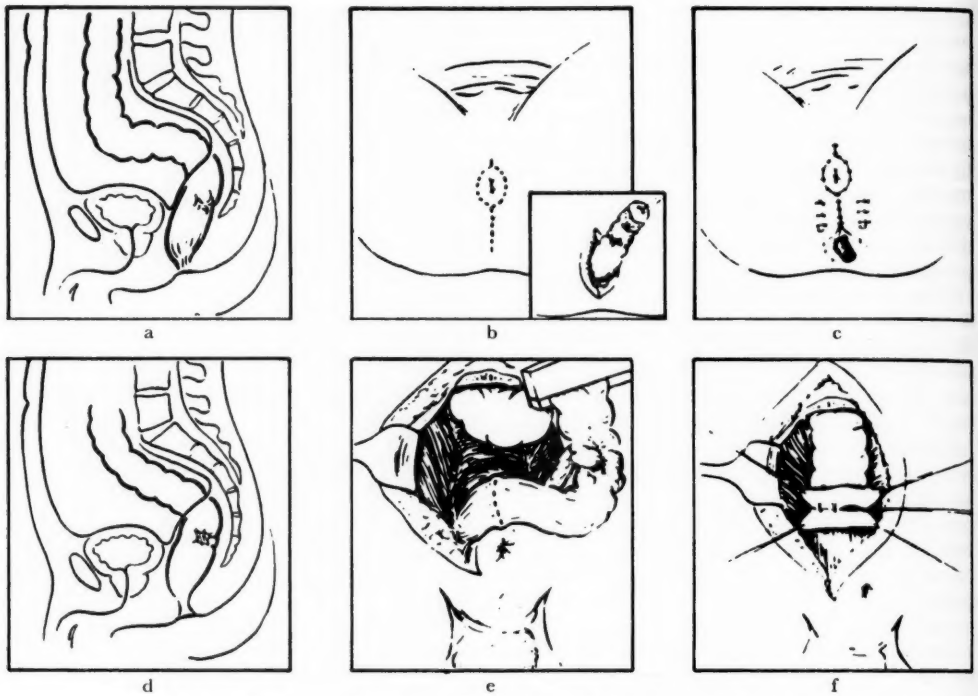


FIG. 30. Perineal and sacral operations. a, b, c, Perineal amputation; d, e, f, Perineal excision with anastomosis.

growth of tumor and thus in the prevention of spread. In a study by Glover and Waugh (1946) it was estimated that 6 months were required for a tumor to involve one-quarter the circumference of the rectum. In 1948, Black and Waugh, studying 103 tumors of the left colon, found the greatest submucosal spread above and below the mucosal edge of the tumor to be 12 mm. Thus, tumors which are completely annular and surround the entire bowel have been shown to be older tumors and thus carry with them a poorer prognosis. It has become increasingly apparent that carcinomas situated in that portion of the rectosigmoid supplied by the inferior and middle hemorrhoidal blood vessels spread laterally along the vessels to the levator ani muscles and sometimes caudally to the ischiorectal fossa. This lateral spread necessitates radical surgical procedures and demonstrates the conservatism of those who advocate anterior resection.

Contrariwise, small tumors should not be looked upon as being safe. Attempts to do so, with resultant conservative resection, have been reported by Bargen, Cromar, and Dixon, who present poor late results in 61 tumors with diameters of 2.5 cm. or less. Most of them had been treated by perineal proctectomy and colostomy. There is a small group of tumors described by Sunderland and Binkley in 1948 and called broad-based papillary adenomas, or termed "villous tumors" by M. R. Ewing of England, that may be treated by the more conservative method with expected cure.

Venous spread. Vein invasion by cancer was observed by Dukes in 17 per cent of more than 1,000 operative specimens of rectal cancer. Among 331 cases of colonic cancer on the left side, vein invasion was found in 12 per cent, while among cases of cancer of the right colon, it was found in 6 per cent. Brown and Warren found vein invasion in 61 per cent of 165 autopsy specimens, and Sunderland found it in 27.6 per cent of 210 colon and rectum specimens. Grinnell found it in 34 per cent of 320 cases. These high values

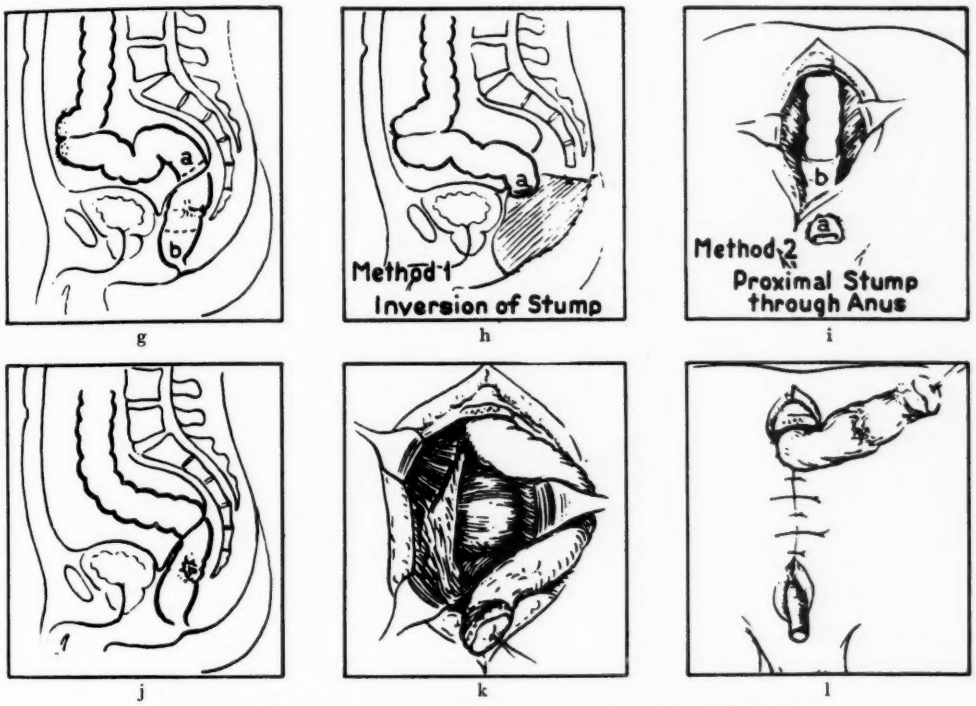


FIG. 30 (continued). g, h, i, Colostomy plus perineal excision; j, k, l, Kraske. (*Treatment of Cancer and Allied Diseases*, ed. 1. Paul B. Hoeber, Inc.)

pertaining to vein invasion in patients with cancers of the rectum and colon indicate that a radical procedure must be practiced to excise the cancers, and that the excision must include as much of the venous tributaries as possible.

Liver metastases. In an attempt to correlate the incidence of liver metastases and vein invasion, Dukes found that of 20 patients in whom gross tumor invasion had been found in the veins of the resected specimen, half had liver metastases, and of those without evidence of vein invasion, one-fourth had liver metastases. In Grinnell's series, evidence of liver metastases was found in 28 of 186 colon and rectal cases. The metastases occurred in 27 per cent of those in whom vessel invasion was seen microscopically, and in only 7 per cent of those in whom it was not. In Grinnell's series, metastases were found in 43 per cent of the colon cases and in 53 per cent of the rectal cases. In correlating the survival rate with the incidence of metastases, he found that at least three-quarters of the patients with more than five nodes containing metastases are expected to be dead within 5 years. His findings confirmed Dukes' results.

Blood supply of the rectosigmoid and rectum. In 1907, Sudeck found infrequent collateral circulation below the sigmoid and this region has since been known as "the critical point of Sudeck." In a careful study by Greenberg in 1950, adequate anastomosis was found throughout the entire rectosigmoid. This study, performed by injecting a dye into the sigmoidal artery, has confirmed Dixon's clinical impression when he stated, "My colleagues and I do not recognize any critical point in this determination. . . . The rectal stump can survive if supplied by the inferior hemorrhoidal vessels alone . . . secondly, Sudeck's point is not as critical as described."

Excision of the inferior mesenteric artery during colonic resection for rectal cancer. Goligher (1949) performed extensive studies regarding the anatomy of the left colon, with special emphasis on the distribution of the inferior mesenteric artery. He

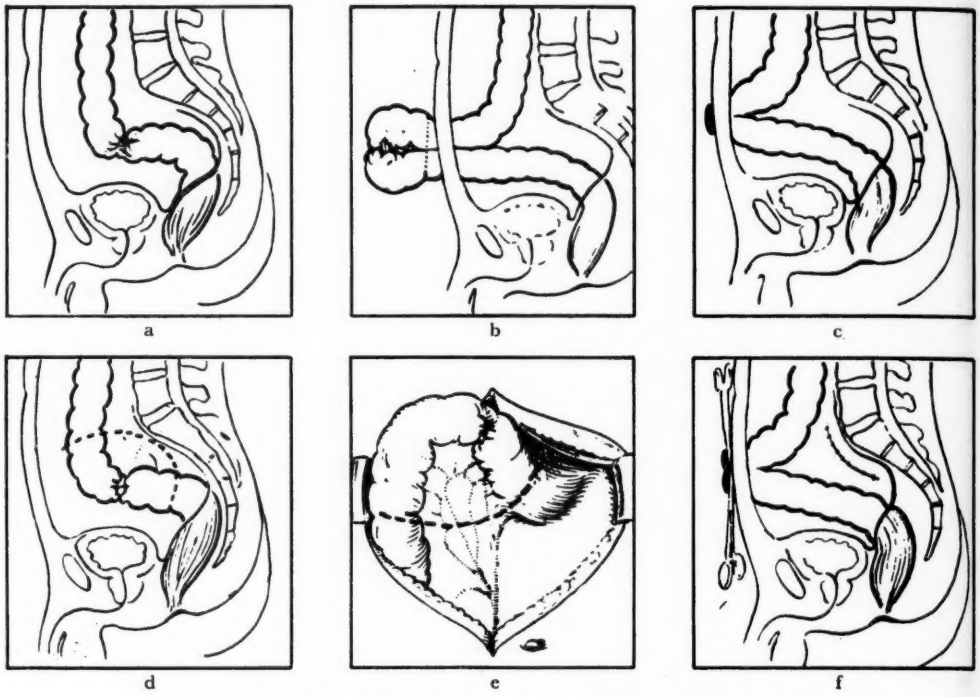


FIG. 31. Intra-abdominal operations. a, b, c, The Mikulicz operation; d, e, f, Obstructive colostomy (Rankin).

dissected 75 adult cadavers and observed that the first sigmoid and left colic arteries arose conjointly in 40 of the 75 specimens. Their common origin lay opposite the bifurcation of the abdominal aorta. Greenberg (1950) also recently investigated the vascular supply of the sigmoid and rectum. On the basis of the studies pertaining to the lymphatic metastases and application of the knowledge regarding the vascular supply to the left colon, Ault, Castro, and Smith (1950) have re-emphasized the need for the cephalad dissection in performing the abdominoperineal resection in order to ligate the inferior mesenteric vessels, and thereby increase the scope of their lymph node dissection. The necessity for ligating the inferior mesenteric vessels to perform an adequate dissection was first advocated by Miles in his original article, in which he described a high ligation of the inferior mesenteric artery to include those nodes which he had shown to lie in close approximation to the blood vessels. Lord Moynihan (1908) also practiced ligation of the inferior mesenteric vessels for both the abdominoperineal resection as well as the anterior resection of cancer of the left side of the colon. Deddish (1950, 1951), in addition to ligating the inferior mesenteric artery, also advocates the resection of the periaortic lymph nodes and performs a total hysterectomy, bilateral salpingo-oophorectomy, and excises the posterior half of the vagina in continuity. He has observed an 8.5 per cent incidence of metastases to the ovaries in women bearing rectal cancers.

Total left colectomy. The left colon may be regarded as a surgical unit on anatomic grounds. Singleton (1943), in studying the blood supply of the large bowel, demonstrated that the left colon and upper rectum are supplied by branches of the inferior mesenteric artery and the remainder of the rectum and anus are supplied by the middle and inferior hemorrhoidal arteries by means of an intricate network of arcades. An intercommunicating series of lymph nodes accompany the vessels. In an effort to make the resec-

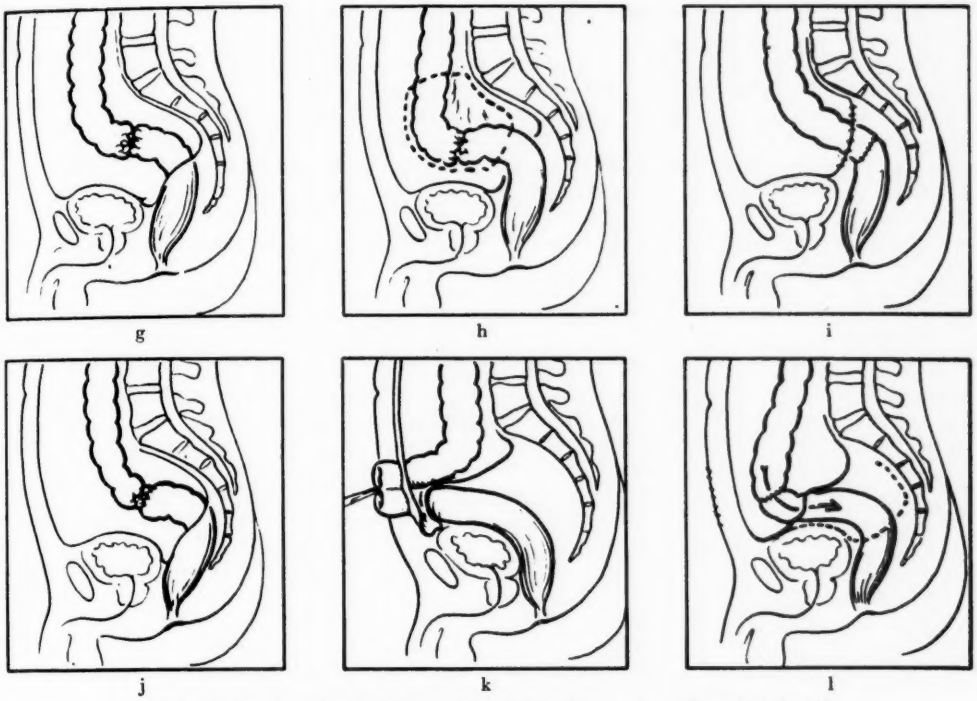


FIG. 31 (continued). g, h, i, Intra-abdominal incision and anastomosis (Dixon); j, k, l, Mobilization and exteriorization with realignment of peritoneum (David). (*Treatment of Cancer and Allied Diseases*. ed. 1. Paul B. Hoeber, Inc.)

tion of cancer of the left colon and rectum all inclusive, different procedures are performed. Jamieson and Dobson (1909) first suggested left colectomy for cancer of the rectum or left side of the colon. Rosi (1949) performs hemicolectomy and abdominoperineal resection of the rectum. In some instances he performs left hemicolectomy, ligates the inferior mesenteric vessels, and anastomoses the transverse colon to the ampulla of the rectum. State (1951) performs a hemicolectomy, resects the inferior mesenteric vessels, and dissects the periaortic lymph nodes from the level of the obturator nodes. Meyer (1951) and Grinnell (1950) perform similar procedures. In certain instances, notably for cancers of the splenic flexure, a splenectomy accompanies the left hemicolectomy.

Classification of the various methods of radical excision. The numerous operations for the excision of rectal and rectosigmoid tumors bespeak a prolonged period of surgical evolution, the conquest of intraperitoneal sepsis, the effort to save sphincteric control when possible, and, in general, a high degree of surgical ingenuity and perseverance. All methods fall basically into one of three types: (1) excision from below (Kraske, perineal); (2) excision solely from within the peritoneal cavity (Mikulicz, Paul, Dixon); and (3) a combined or abdominoperineal excision (Miles operation or some variant). Minor modifications and combinations of factors have produced a wide array of special methods performed in one or multiple stages.

The one-stage abdominoperineal operation of Miles is generally performed today almost exactly as described by Miles 46 years ago, except that a more thorough dissection of the pelvic lymph nodes is performed to include the iliac and obturator groups. It is a well conceived operation which fulfills all the following surgical fundamentals: (a) the bowel is severed at an ample distance from the malignant tumor; (b) the blood and lymph vessels to the rectum are ligated and severed before the primary cancer

is tampered with or manipulated in any way; (c) the aseptic and nonimplicated region is dissected first, obviating the danger of implanting cancer cells into a clean field, as might occur if the dissection were first made in closer proximity to the mass, i.e., from below upward; and (d) not only the primary tumor itself but all avenues of extension as well, upward, lateralward, and downward, are excised en masse and without disturbance of any tissues between the tumor itself and the extreme limits of the lines of the incision. The only operations which meet all of these principles are essentially special modifications of Miles' original procedure.

These optional procedures may be studied advantageously by means of Figures 30, 31, 32, and 33. The important consideration is that through these several methods the operator has at his disposal one or more expedients to meet every exigency. It is no longer necessary to begin an operation with a preconceived plan which may or may not prove applicable to meet the intra-abdominal conditions. Many variables will determine the course of action; some concern the neoplasm itself, others the surgeon and surgical team, and still others the surgical condition of the patient. In no instance should the complete procedure be rigidly predetermined before the peritoneal cavity is opened. Certain surgeons are treating cancer of the sigmoid and upper rectum by an anterior dissection and anastomosis (Dixon, Wangensteen). Their results must be critically appraised.

Welch, Rhinelander and Swenson have described a modified "pull-through" operation, similar to that of Bacon but more radical, in which the proximal section of bowel is sutured to a remnant of anal mucous membrane on the outside. Recent surgical advances for treating rectal cancer consist of pelvic exenteration and dissection of the lateral and proximal lymph nodes.

CANCER OF THE ANUS

Cancer of the anus differs from that of the rectum in both the degree of malignancy and routes of spread. It usually necessitates a bolder form of therapy. A comprehensive review was presented by Raiford in 1933. Buie and Brust in the same year studied 51 cases of anal epidermoid carcinoma and emphasized the high degree of malignancy. In 1941, Gabriel reported 55 cases of anal carcinoma and advised block dissection. Further studies regarding the metastatic spread of these tumors were those of Raven, Keyes, and Darier and Ferrand. As a result of the appreciation of the lymphatic spread from the anus, it is necessary to perform the abdominoperineal resection of Miles in continuity with a bilateral inguinal dissection. The cure rates leave much to be desired. Kerr reports that 28.5 per cent of the patients are alive, but all are not free of cancer. Keyes had a 41.5 per cent 5 year survival. Gabriel noted a 30 per cent cure rate among 30 cases, and Roux-Berger has reported a 33 per cent 5 year cure with radiation therapy alone. Binkley reports a 29 per cent cure rate for his total group of 125 patients and a 41 per cent survival rate for the operable cases (including epidermoid carcinoma of both the anus and rectum).

TREATMENT OF TUMORS OF THE PANCREAS

The treatment of pancreatic tumors started historically in 1935 when Whipple, Parsons, and Mullins performed a two stage pancreaticoduodenectomy for carcinoma of the ampulla of Vater. However, extirpative surgery of the pancreas actually had its beginning with the medical discovery of Banting and Best, who, in 1922, extracted and identified insulin. This led to an understanding of the clinical entity of hyperinsulinism and the recognition of functional adenomas of the islet cells described by Langerhans in 1869. Seale Harris (1924) was impressed by the similarity of the spontaneous symptom complex to induced hyperinsulinism, and hypothecated that the entity of hyperinsulinism was due to overactivity of the islet cells. Nicholls had identified an adenoma of the islet tissue in 1902. The first benign islet cell adenoma was removed by Roscoe Graham in 1929, with relief of the symptoms of hyperinsulinism.

The observation that certain islet cell tumors are functioning and others are not led to a classification of these tumors by Lopez-Kruger and Dockerty as follows:

1. Adenomas of the islet cells without hypoglycemia
2. Adenomas of the islet cells with hyperinsulinism
3. Metastasizing carcinoma of the islet cells without hyperglycemia
4. Metastasizing carcinoma of the islet cells with hyperinsulinism

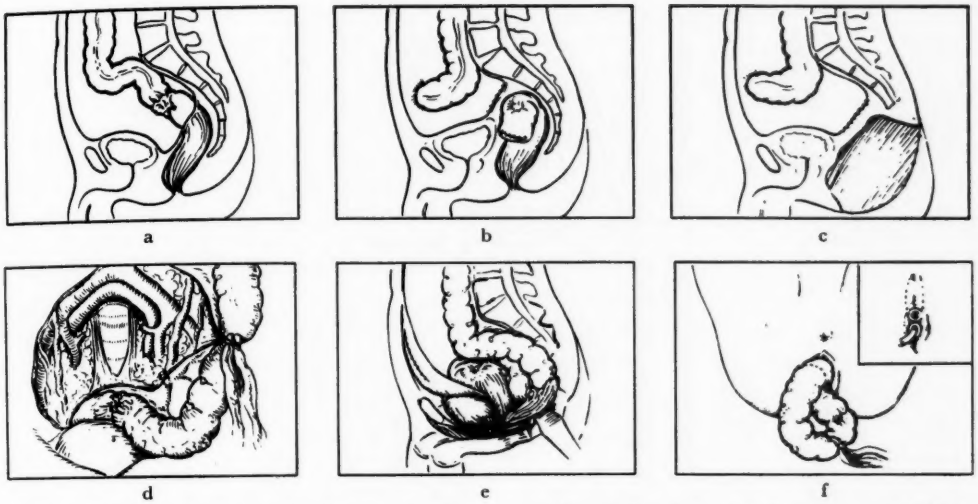


FIG. 32. One-stage abdominoperineal operations. The Miles operation: a, preoperative state; b, end of abdominal phase; c, end of perineal phase. The Babcock operation: d, the abdominal dissection; e, end of abdominal phase; f, end of perineal phase. (*Treatment of Cancer and Allied Diseases*. ed. 1. Paul B. Hoeber, Inc.)

5. Borderline malignant islet cell tumors with or without insulinism.

Whipple presented the following essentials which justify exploration for pancreatic adenomas.

1. The attacks must come on after a period of fasting or after extreme exertion.
2. The blood sugar value during an attack or after 12 hours of fasting must be below 50 mgm. per 100 c.c.
3. The symptoms must be relieved promptly by the oral or intravenous administration of sugar.

By adhering to his criteria Whipple found tumors in 27 of the 32 patients with hypoglycemia upon whom he operated.

The operative procedures performed for islet adenomas are enucleation, distal pancreatectomy, subtotal pancreatectomy, and total pancreatectomy. Cattell has stressed the importance of the multiplicity of these tumors.

Carcinomas Arising from the Head of the Pancreas, the Ampulla of Vater, and the Distal Portion of the Common Duct

These tumors represent a difficult group of tumors to diagnose and treat. The first pancreaticoduodenectomy was reported by Whipple, Parsons, and Mullins as a two stage procedure in 1935. Prior to this, numerous attempts had been made. Halsted, in 1898, successfully removed a carcinoma of the ampulla of Vater through the transduodenal route. Previously, Billroth (1884) reported total excision of the pancreas with recovery of the patient. Kausch, in 1912, removed a carcinoma of the ampulla of Vater with a two stage pancreaticoduodenectomy.

The first resection of cancer of the head of the pancreas was performed by Brunschwig in January, 1937 when he performed a one stage pancreaticoduodenectomy. In 1943, Brunschwig discovered a marked insulin hypersensitivity in patients shortly after pancreatectomy.

Cattell has stressed the difficulty of establishing the absolute diagnosis. He states that biopsy at the time of operation will often reveal only chronic pancreatitis. Aspiration with a Silverman needle will at times be successful and he states that with few exceptions in his experience has it been necessary to proceed without positive histological diagnosis. However, he emphasizes that resection was not performed unless dilatation of either the pancreatic duct or biliary tract could be demonstrated.

In 1941, Trimble, Parsons, and Sherman described a one stage procedure. Additional investigation and exploitation of the pan-

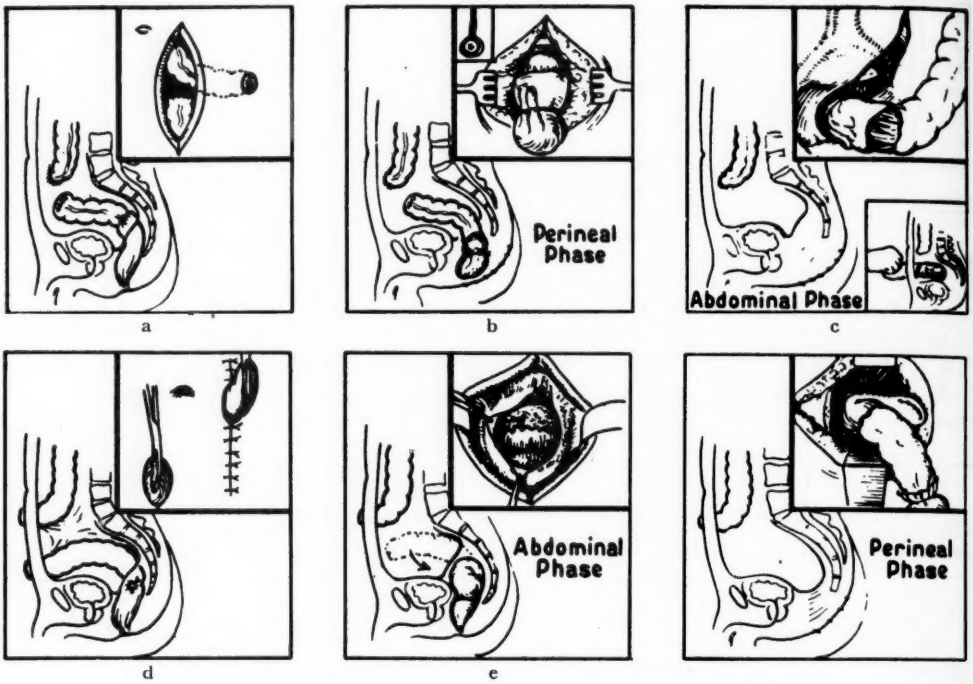


FIG. 33. Multiple stage operations. a, Stage I, and b, c, Stage II of Rankin modification; d, e, f, Lahey modification.

creaticoduodenectomy technique were performed by Hunt and Budd, Harvey and Oughterson, Cattell, Pearse, and Dennis and Varco.

Total pancreatectomy may be performed in certain situations. This operation was first performed by Rockey in 1943, but the patient died 2 weeks postoperatively from bile peritonitis. The first successful total pancreatectomy was accomplished by Priestley (1944) for functioning adenoma, and in the same year Fallis successfully performed one for carcinoma. Nardi (1952) collected 27 total pancreatectomies.

TUMORS OF THE LIVER

Although the abdominal cavity was the first visceral compartment to be surgically explored, the liver has been the last organ to succumb to subtotal resection. A segment of the liver was removed by Lius in 1886. The entire right lobe of the liver was not surgically extirpated until 1949. The surgical disciplines for effecting liver resections were developed during the last portion of the past century and the beginning of this one. From 1886 to 1892, 21 partial hepatectomies were performed, and from 1892 to 1897-38 additional partial hepatectomies were per, formed, with a total mortality of 15.5 per cent for the 59 collected cases. The hazards of hepatic resection were considered to be liver failure from insufficient hepatic tissue and fatal hemorrhage. A fatal hemorrhage following hepatic aspiration reported by Richard and Broca (*Rev. Chir.*, March, 1897) focused on this danger. Keen, in the 1897 issue of the *Pennsylvania Medical Journal*, listed four methods for controlling hemorrhage: 1, ligature; 2, packing with gauze; 3, the use of the cautery; and 4, the use of an elastic ligature. Frequently, two or more of these methods were used.

In 1899, Keen reported a total left hepatic lobectomy for cancer. Regarding performance of this operation on April 23, 1899, he states, ". . . it seemed to be possible to remove the entire left lobe of the liver and with it the whole of the tumor, so I proceeded at once to its extirpation. The operation was done entirely with the Paque-

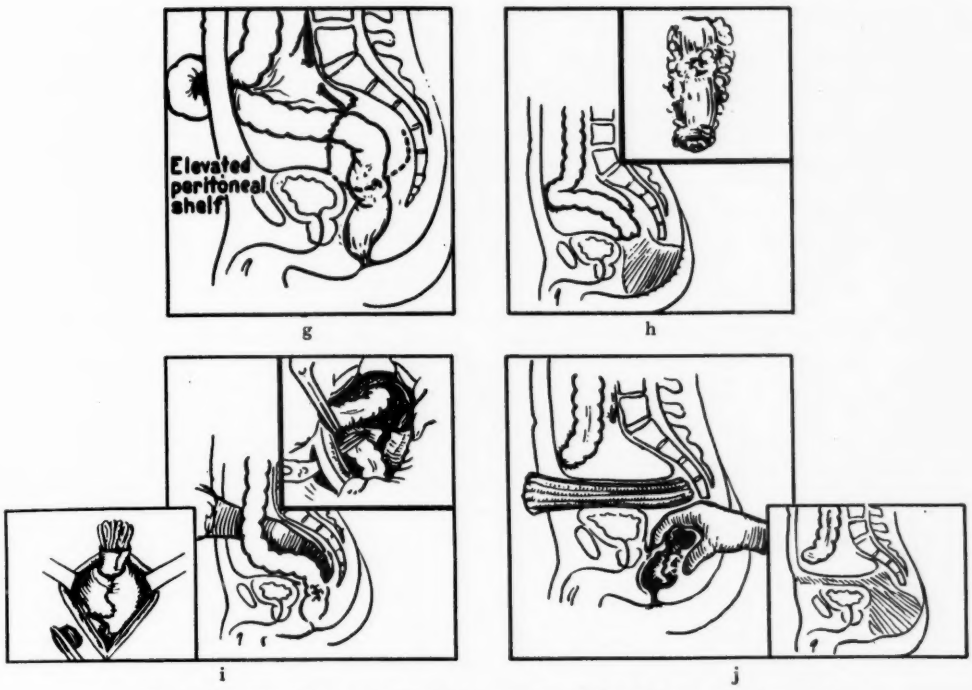


FIG. 33 (continued). g, stage I, and h, stage II, of Daniel Jones procedure; i, j, Coffey operation. (*Treatment of Cancer and Allied Diseases*. ed. 1. Paul B. Hoeber, Inc.)

lin cautery. It took from 20 to 30 minutes to sever the left lobe from the remainder of the liver. The hemorrhage was not very severe except when I burnt into several of the larger veins. Each of these, when opened, I was able instantly to close by my left forefinger. Then, temporarily laying aside the cautery, I passed a catgut ligature under each by means of a Hagedorn needle, and one of my assistants tied it slowly but firmly. Five ligatures were thus applied." He states that there was a loss of 8 to 10 ounces of blood, and that the patient had a most uneventful postoperative recovery.

At the end of the last century, 76 partial resections of the liver and 1 left lobectomy had been done. These resections were done for many different conditions, including angioma, echinococcosis, gumma, tuberculoma, adenoma, hamartoma, and carcinoma. From a review of the literature, it seems that no hepatic lobectomy was performed from the time that Keen performed his until 1921, when Peck performed a left lobectomy of the liver for an angioma which weighed approximately 4 pounds. The procedure was performed by cutting the coronary ligament and tying the pedicle. Love, in 1934, reported a successful left lobectomy for hepatoma of the liver. The patient died 4 weeks later, apparently from metastases. In a comprehensive article by Pickrell and Clay, written in 1945, 3 cases of left lobectomy for primary carcinoma, hemangioma, and gumma were reported. Von Prohaske, in 1945, performed a left hepatic lobectomy for a mesenchymoma.

The attack upon the left lobe of the liver has been a successful one and primary neoplasms from this lobe can be successfully extirpated. The justification for performing hepatectomy for metastatic cancer remains to be established, although it would seem indicated at least for solitary metastasis. The establishment of the anatomic dissection for left hepatic lobectomy was done by Hershey, Raven, and Donovan and Santulli, who employed the technique of isolation and ligation of the left branch of the portal vein, left hepatic duct, and left branch of the

hepatic artery, prior to removal of the left hepatic lobe.

It was not until the past decade that Wangensteen, on November 30, 1949, successfully removed the entire right lobe of the liver. He described the control of bleeding "by the application of Blalock clamps to the hepatic artery, superior mesentery artery, and portal vein during the excision, plus ligation of the hepatic vein after clamping as they were encountered." Tinker and Tinker and, independently, Raffucci have indicated that a 15 minute span is the maximum that ischemic pressure can be applied safely to the hepatoduodenal ligament. Lortat-Jacob and Robert in 1952 effected a successful right hepatic lobectomy for metastatic cancer. Quattlebaum, in 1952, performed a successful right lobectomy for primary cancer of the liver, in 1953 Pack and Baker removed the right lobe for a granulomatous tumor, and in 1953 Mersheimer successfully performed a right hepatic lobectomy for a primary hepatic cell carcinoma.

Important adjuncts to hepatic surgery resulted from the study of Markowitz of the Banting Institute in Toronto, who found that small doses of penicillin will protect against anaerobic infection following ischemia in the liver of dogs. A critical study was made by Nicholas Michels of the Jefferson Medical College in Philadelphia, pertaining to collateral arterial pathways to the liver which would permit preliminary ligation preparatory to radical surgical extirpation. Postoperative metabolic studies on the various patients who have had right hepatic lobectomies reveal essentially rapid return to normal function.

TREATMENT OF CANCER OF THE FEMALE GENITAL TRACT

Cancer of the Vulva

Vulval cancers were first treated by local surgical extirpation, but the frequent recurrences resulted in attempts to treat them by irradiation. This procedure was unsuccessful as the tumors in the moist, avascular, and atrophic vulvae in the aged patients do not lend themselves well to treatment by radiotherapy.

An appreciation of the lymphatic spread from the vulva, discovered by anatomists during the latter part of the last century, led Basset in 1912 to remove the regional nodes as well as the primary tumor. Stoeckel (1930), Kehrer (1912), and Taussig (1941) developed the operation of vulvectomy combined with radical inguinal lymphadenectomy. The combined operation is now done as a one-stage procedure whereas in earlier years the vulvectomy preceded the bilateral groin dissection by 2 to 6 weeks.

In 1949, Berven, from the Radiumhemmet, introduced a method of coagulating large segments of the vulva for treatment of vulval cancer and reported a 38 per cent 5 year cure rate. Way has presented standardized principles of surgical treatment which are: (1) complete and wide removal of the tumor itself, (2) complete removal of the lymph nodes until all nodes involved with cancer have been removed, and (3) removal of any premalignant lesions from which a new primary cancer can develop. McKelvey (1951), who performs the radical vulvectomy and bilateral groin dissection, utilizes a method of plastic repair to afford good closure of the wounds which, when left open, result in infection in approximately 50 per cent of the cases.

Carcinoma of the Vagina

Way states, "No carcinoma of the female genital tract is more difficult to treat successfully than a carcinoma of the vagina." This cancer, first described by Cruveilhier in 1826, was not adequately treated until the turn of this century. Herman, in 1886, produced a vesicovaginal fistula in order to effect an outlet for retained excretions, and Roberts in 1896 advised excision of these tumors but his contemporaries disagreed. Wertheim, in 1905, reporting on cancer of the cervix, added the remark that the upper third of the vagina should also be removed. As late as 1935, Taussig stated, after having attempted surgery and studied the effect of radium, "We acknowledge our total inability to do anything effective for primary cancer of the vagina." Pessimistic outlooks can be noted from reviews in the literature. De Buben, in 1931, published the results in 129 patients treated with radium, and reported a 4 per cent 5 year survival.

Various methods were used in attempts to irradiate the vagina. White used a stent in which radium needles were imbedded. Lederman and Mayneord used radium applicators with a wax center, and Focht, Marinelli, and Twombly of New York devised a radium applicator with needles which were placed eccentrically. Way devised a plastic vaginal radium applicator. Transvaginal irradiation has also been attempted. The results have been unsatisfactory.

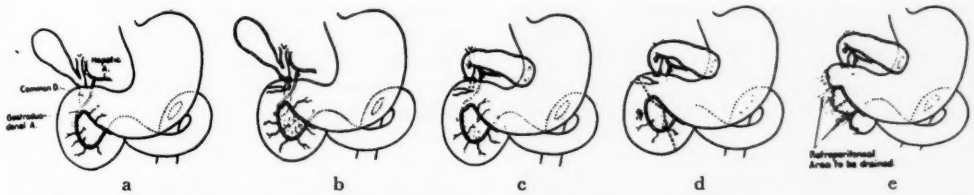


FIG. 34. Illustrating the operative technique employed for resecting the first cancer of the ampulla of Vater. a, b, and c, First operation; d, second operation; e, the end stage. (Whipple, Parsons, and Mullins. Treatment of Carcinoma of the Ampulla of Vater. *Annals of Surgery.*)

Cancer of the Cervix

Cancer of the cervix is the most common gynecological cancer, exceeding all others combined. It is one of the most frequent causes of death from cancer in women. An unexplained phenomenon of the natural history of cervical cancer is that Jewish women are relatively immune to it.

The treatment for cancer of the cervix received its impetus in 1898 and the methods were developed throughout this century. In 1898, the year that radium was discovered, Wertheim began his radical hysterectomy series. The early management of cervical cancer consisted of bleeding, purging, vaginal irrigation, and abstention from spices, meat, wine, and coitus. Then followed an era when various caustics were applied or injected into the cervix and parametria.

It is stated that Ambroise Pare (1510–1590) advocated amputation of the cervix for cancer, but it was more than 200 years before this was done by Turner, in 1736. Lisfranc (1790–1847) reported 99 cervical amputations. Vaginal hysterectomy was attempted about this time, and Langenbeck, in 1813, reported such an operation. The mortality was so frightful that Diffenbach, in 1848, called the operation "murder," and Scanzoni, in 1875, said that it belonged to history and should never be done (Way).

Vaginal hysterectomy continued to be performed, however, and in 1890 Pawlik advocated parametrial dissection. Freund, in 1878, had advocated an abdominal hysterectomy for cancer of the cervix. In 1895, Ries of Chicago, working on dogs and cadavers, developed the operative technique which was essentially that of the Wertheim hysterectomy. Clark, at Johns Hopkins Hospital, in 1895, put the suggestion into practice on a patient. Shortly thereafter Howard Kelly of Baltimore, and Thring in Sydney were doing the same operation. However, it was in 1898 that Wertheim started the operative series of the procedure that was to bear his name. Schauta of Vienna developed the radical vaginal hysterectomy by which a paravaginal incision enlarged the field of action, but its advantages were few and it never gained in popularity.

Five years after the discovery of radium, Alexander Graham Bell, inventor of the telephone, suggested to a friend, Dr. Zowers, that radium, which was being used to treat skin cancer, might also be used for internal cancers. Tests were made in 1906. Radium in a glass container was held by the operator and applied to the cervix but the results, of course, were hopelessly poor.

From these beginnings there developed two parallel lines of investigation: (a) attempts by surgeons to improve the cure rates of cervical cancer by surgical methods, and (b) refinement in the techniques of irradiating this cancer.

Surgical treatment of cervical cancer. The Wertheim radical abdominal hysterectomy comprised removal of the uterus, tubes, ovaries, parametria, a good portion of the vagina and paravaginal tissues, and resection of the pelvic nodes as high as the aorta. Wertheim himself seldom removed the nodes unless he could show that they were enlarged. Bonney, one of the greatest exponents of this operation, performed it with persistence, accumulating a series of unselected cases importantly available for statistical purposes. The operability rate for radical hysterectomy had been fairly high before irradiation became widely used; e.g., in 1905, Wertheim reported his operability rate as 50 per cent, and Berkeley and Bonney, in 1913, reported theirs as 63 per cent. The great number of patients with cancer of the cervix who reported to Wertheim for treatment was recorded by Weibel in 1928; on 3,194 patients with this disease, Wertheim

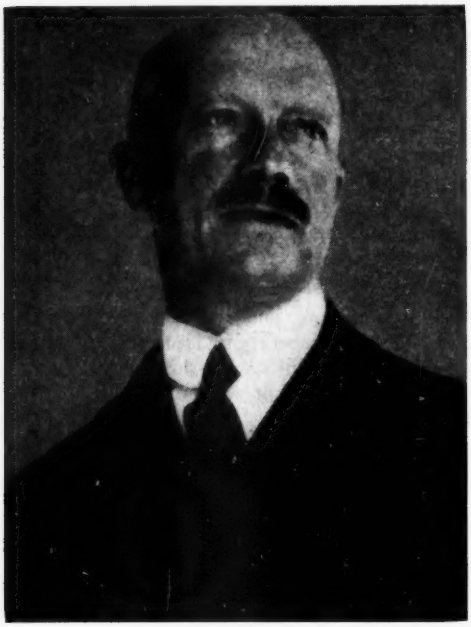


FIG. 35. Ernst Wertheim.

performed 1,500 operations, with an operability rate of 47 per cent. The operative mortality rate of the early days was reported by Wertheim, in 1905, as 20 per cent, significantly lower than the operative mortality of the previous century. Meigs (1946) reported 90 cases without a death, and Read and Cook, in 1947, reported a large series with a mortality of 3 per cent.

Following the description of the resection of the deep inguinal and iliac nodes by Taussig, Meigs (1939), and later Brunschwig (1947), combined the Wertheim hysterectomy with a radical pelvic lymph node dissection. Taussig introduced this operation in 1930, using the intraperitoneal route. Nathanson's modification consists of an extraperitoneal approach to these lymph nodes. Reference to Wertheim's illustrations depicting his operative specimens reveals how much more radical are the panhysterectomies of today.

Pelvic exenteration. During the second decade of this century Joseph Brettauer of Mt. Sinai Hospital, New York, working with the urologist Edwin Beer, attempted radical exenterative pelvic operations, removing multiple organs, but in those days prior to the availability of blood banks and antibiotics, the results were so discouraging that the efforts were abandoned. In January, 1950, Appleby reported 4 successful pelvic exenterations for carcinoma of the rectum in males. They were alive 7, 5, 2 and 4½ years, respectively, after the operation. Bricker performed the operation twice in 1940 but both patients died operative deaths. Brunschwig (1948) was the first to report radical pelvic exenteration performed in 1946 for cervical cancer. This included a removal of the bladder, rectum, genital tract, and the intervening lymphatic structures. He deserves credit for the recent increased interest in the procedure.

Irradiation of cervical cancer. The irradiation of cervical cancer, based upon a knowledge of its lymphatic spread, represents one of the most exact scientific studies in the clinical application of radiation. Following the earliest attempts at manually holding radium in glass containers against the cervix and the early attempts to apply radium needles interstitially, the science has progressed in a logical sequence. The first method was that of intracavitary irradiation and the various techniques were devised to irradiate the cervix and parametria according to exact laws of radiation physics. The two basic schools of thought for developing the intracavitary routes of therapy came from Stockholm, where a short intensive course of radium was applied at weekly intervals, and from Paris, where a continuous, low intensity radium source was utilized.

Many radiologists have devised their radiation programs according to these basic principles and have developed equipment and isodose curves to irradiate cervical cancer and its routes of dissemination. One of the earliest efforts was that of the late William P. Healy in Memorial Hospital who utilized a method originally devised by Bailey and Quimby in 1915. In addition to x-ray therapy and intrauterine radium applicators, a vaginal radium bomb was employed. The radiation physics was analyzed by Failla. In 1935, Arneson and Quimby published the isodose curves of Healy's technique and showed that the outer portion of the pelvis could be more adequately irradiated by utilizing two lateral ports in addition to the four as advocated by Healy. Other techniques of irradiation were those of Bowing and Fricke of the Mayo Clinic; Burnam, Ward (G. E.), and Neill of the Howard A. Kelly Hospital in Baltimore; Ward (G. G.) and Farrar of the Woman's Hospital, New York; Schmitz

in Chicago; Regaud *et al.* of the Radium Institute of Paris; Margaret C. Tod of the Holt Radium Institute of Manchester; and Heyman and Forssell of Radiumhemmet, Stockholm.

The Tod and Meredith Manchester dosage system was developed in 1938 in order to obtain more uniformity for radium distribution and used ovoids of various sizes as measuring devices. Shortly thereafter, Way, Farmer, and Thurgar designed the plastic vaginal colpostat as a more precise instrument for performing these treatments.

The inadequacy of intracavitary radium caused Donaldson and others in 1927 to supplement this with the implantation of radium needles into the parametria through the abdominal route. Later, Twombly *et al.* (1950) advocated a similar procedure by way of the vagina. Various modifications have been utilized, including the use of supplementary x-ray therapy from external ports in both the medium and supervoltage range, and the use of intravaginal ports applied through special cones and many other modifications. Arneson has recently (1954) reported on injecting radioactive gold into the parametria.

Cervical carcinoma in situ. Cancer of the cervix starts as a small focus. Schiller, in 1927, and later Galvin and TeLinde believed that localized foci of carcinomatous degeneration eventually developed into infiltrating cancer. These tumors, called carcinoma in situ, were discussed by Howard C. Taylor, Jr., at the Fourth Annual Cancer Symposium of the James Ewing Society in March, 1951. There are major approaches for treating these tumors.

1. The tumors are treated by a modified Wertheim procedure by TeLinde. The fact that there was no recurrence and no extension to the parametria in TeLinde's series suggests that this operation is unnecessarily extensive.

2. Some recommend trachelectomy, utilizing the Sturmdorf procedure or even simple cauterization. Taylor states that with careful observation, the life of the patient will not be jeopardized by this procedure, and that the procedure should be utilized particularly if there is a good reason to preserve reproductive function. He states that at his clinic it is customary to give the desirability of further pregnancy an important place in the decision and that total hysterectomy is reserved for patients of 30 to 35 years of age or older.

Improved diagnostic methods. The Schiller test (1926) is of diagnostic value. Another important development is the cytologic diagnosis by Papanicolaou. This will result in a screening mechanism, but it poses an important problem regarding the exact management of the patients with false positive or false negative reports. Numerous instruments and techniques have been developed for biopsy of the cervix. The study of Foote and Stewart pertaining to the most frequent location of cancer of the cervix is an aid for determining the site of biopsy.

Classification. A method of classifying cancer of the cervix was adopted shortly after World War I by a Committee of the League of Nations. In 1949, under the chairmanship of James Heyman, its annual report gave results of radiotherapy of cancer of the uterine cervix and represents a most noteworthy attempt to evaluate, from worldwide statistics, the accomplishments of treating cancer of the cervix under a uniform classification.

Prognosis. The accomplishments of treatment leave much to be desired. The result of treating 1578 patients with radium at the Paris Radium

Aus der Bettina-Stiftung (gynäkologische Abtheilung des k. k. Kaiserin Elisabeth-Spitals).

Zur Frage der Radicaloperation beim Uteruskrebs.

Von

E. Wertheim.

(Mit Tafel X—XIX.)

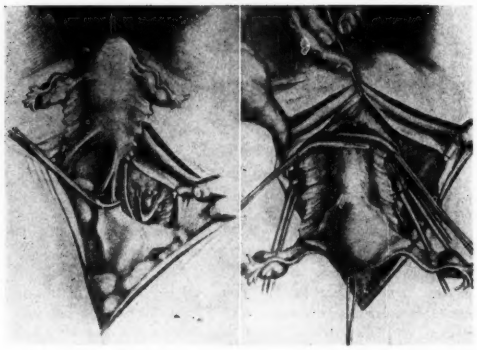
Indem ich mich vor nunmehr 2 Jahren entschlossen habe, in allen Fällen von Uteruscarcinom, in welchen operative Heilung noch möglich erschien, mit dem Uterus die Parametrien und regionären Lymphdrüsen zu entfernen, habe ich mich der Reihe jener Operateure angeschlossen, welche, unbefriedigt von den bisher erzielten Dauererfolgen, durch ein derartig radicales Vorgehen eine Verbesserung derselben anstreben.

Die Zahl der so operirten Fälle beträgt bis jetzt 29.

Wenn auch die Zeit noch viel zu kurz ist, um erkennen zu lassen, ob der angestrebte Zweck erreicht worden ist, so ist doch das Material genügend gross, um durch Verwerthung sowohl in Richtung der in mancher Beziehung noch strittigen Frage der Ausbreitung des Uteruskrebses auf die Umgebung, als auch in Bezug auf Operationstechnik und Indicationsstellung schon jetzt ein Urtheil über die Berechtigung eines Eingriffes zu ermöglichen, der so viel schwerer ist als die bisher üblichen; ein Urtheil, welches freilich der Bestätigung durch die Dauererfolge bedarf, denen naturgemäss die Entscheidung vorbehalten bleibt.

Von diesem Gesichtspunkte aus seien die erwähnten 29 Fälle der Publication übergeben. Um einen möglichst klaren Einblick in die Beschaffenheit derselben zu eröffnen und so eine Nachprüfung in jeder Richtung zu ermöglichen, ist jeder Kranken-

FIG. 36. Title page of the article in which Wertheim describes a radical abdominal hysterectomy, published in Archiv fuer Gynakologie.



a b

FIG. 37. a and b, Illustrations of the technique of hysterectomy described by Wertheim.

Institute revealed a relative five year survival of 32.4 per cent, and an absolute survival of 22.2 per cent. At the Radiumhemmet, Stockholm, where 2140 patients were treated, the relative five year survival rate was 22.8 per cent, and the absolute, 21.6 per cent. At the Marie Curie Hospital, where 836 patients were treated, the relative cure rate was 36.2 per cent and the absolute five year cure rate was 34.9 per cent. At the Christie Hospital in Manchester, 826 patients were treated between 1934 and 1938 and the relative five year survival rate was 28 per cent. In Way's series, in Newcastle, 1,047 patients were treated with a relative 5 year survival rate of 24 per cent. Way has calculated Bonney's surgical results and found that of an estimated 777 patients treated, the relative 5 year survival rate was 40 per cent and the absolute 5 year rate was estimated at 26 per cent.

It will thus be seen that there is a parallel rate of cure in those patients treated by irradiation and those treated by surgical methods. Attempts are being made to strive for earlier diagnoses. Surgeons are attempting to define the limitations and indications of operability and to refine the surgical techniques. Improvements of radiotherapy include the use of radioactive cobalt, radioactive colloidal gold or chromic phosphate, betatron, and supervoltage x-rays.

Cancer of the Body of the Uterus

In 1905 the methods of treatment for cancers of the cervix and of the corpus uteri were identical. They consisted chiefly of the Wertheim radical hysterectomy for which the operative mortality at that time was about 40 per cent. A classification of endometrial cancers by Mahle in 1923 divided the cancers into grades 1, 2, 3, and 4, the grade depending upon their extent, and Way asserted that lymph node metastases were rare, and that spread occurred by way of the fallopian tubes and occasionally via the bloodstream. Metastases to the vault sometimes occur after hysterectomy. Suburethral metastases occur in 10 to 15 per cent of the patients and are believed by Bonney to represent extension by means of the uterine venous plexus.

Various factors predisposing to the development of corpus cancer have been described and these include endometrial hyperplasia (Herrell) and previous irradiation to induce the menopause (Taylor and Becker; Smith and Bowden). Smith and Bowden (1948) found that of 752 patients treated by irradiation for benign uterine lesions, 0.93 per cent developed carcinoma. Estrogenic tumors have been defined as producing endometrial carcinoma; thus, Hodgson, Dockerty, and Mussey (1945) reported on 62 patients with granulosa cell tumors, 8 (12.9 per cent) of whom had an associated endometrial cancer.

The American College of Surgeons has suggested a classification of corpus cancer which is as follows: (a) tumor limited to the body of the uterus, (b) involvement of the broad ligaments, (c) vaginal metastasis, (d) regional metastasis, and (e) remote metastasis. This classification is of use in recording the prognosis and the end results.

The method of treating corpus cancer today consists of radical panhysterectomy. One significant advance in treatment is the intracavitary use of radium preceding the total hysterectomy. Heyman has used radium packed into the uterus, and more recently Traut has used small cobalt 60 beads on a ribbon which he packs into the uterus.

Tumors of the Ovaries

Improvement in the treatment of ovarian tumors during the twentieth century has resulted from a better understanding and classification of these neoplasms. The various benign tumors of the ovary are: follicular or corpus luteum cysts, which need be observed only; endometriosis which can be treated expectantly or by conservative surgery or irradiation; pseudomucinous cystadenomas, which usually require only a uni-

lateral oophorectomy; fibroma, which produces the well known Meigs syndrome and can be treated by unilateral oophorectomy or cystectomy; dermoid cyst, requiring unilateral oophorectomy or cystectomy; and the papillary serous cystadenoma which is one of the most frequent tumors, has almost a 50 per cent probability of being malignant, and should be treated by a radical bilateral oophorectomy and preferably by hysterectomy. There are a number of unusual tumors which arise in the ovary. The granulosa cell tumor, the most common of the germ cell tumors, produces functional disturbances such as precocious puberty and the recurrence of menstruation in postmenopausal women. The treatment employed depends upon the age of the patient. Young girls may be treated conservatively by unilateral oophorectomy, and older women should be treated by more radical methods. Dysgerminoma may be accompanied by pseudohermaphrodism or genital hypoplasia, often bilateral, and management is difficult because, although unilateral oophorectomy will sometimes produce cure, such conservatism may be dangerous; the best treatment is radical resection. Arrhenoblastoma is the masculinizing ovarian tumor which is rarely encountered. It may be treated by unilateral oophorectomy. The Brenner tumor, of doubtful origin, is small, benign, and is generally removed incidentally during other procedures.

Ovarian cancers are now removed by panhysterectomy to include both ovaries, tubes, and uterus. Technically inoperable cancers may receive preliminary x-ray therapy which sometimes permits later surgical extirpation. Even in the presence of diffuse peritoneal carcinosis, a surgical effort should be made to remove both ovaries. X-ray therapy offers marked palliation in treating metastases from ovarian cancer. The use of colloidal gold 198 and radioactive chromic phosphate to treat ascites from disseminated ovarian cancer represents a recent clinical advance.

(*Concluded in June issue.*)

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

The Treatment of Fractures of the Zygoma (Zur Behandlung der Jochbeinbrueche). H. R. SCHOENBAUER. *Chirurg*, 1954, 25: 404.

IN THE 10 YEAR PERIOD from 1940 to 1949, 143 cases of fractures of the zygoma were treated in the service of Lorenz Böhler at the Accident Hospital of Vienna. The author discusses the pros and cons of the various methods of treating these fractures and explains that many critics of Böhler's technique misunderstood it in the first four editions of his "Technique of Fracture Treatment." The fifth edition explains that all patients were treated under local anesthesia and were ambulatory unless other complications were present. A small skin incision above the temporal hair line permits the placing of an elevator to raise the fragments which are then impacted, neither wire extension for maintenance of position nor sutures to close the skin being necessary.

A personal review in 1950 of the 19 cases in which treatment was given in 1949 convinced the author that the results were cosmetically perfect. There have been no infections in 40 years and 100 per cent satisfaction has been obtained with Böhler's technique.

—Robert C. Combs, M.D.

Morphologic Changes in the Mastoid Bone Under Antibiotic Therapy. MARVIN J. TAMARI and PAUL B. SZANTO. *Arch. Otolar.*, Chic., 1954, 60: 133.

THE CLINICAL COURSE of otitis media is changed by the use of various antibiotics, but the correlation of the altered clinical course with the histopathologic changes has received little attention. The phenomena of "masking" very often characterizes otitis media under antibiotic treatment. "Masking" describes that phase of latency in regard to signs and symptoms which is observed prior either to resolution or to complication. Examples of clinical latency are to be found in the so-called latent otitis media of infants, serous otitis media, tuberculous otitis media of infants and young children, and Type 3 Diplococcus pneumoniae otitis media. The most typical pre-antibiotic latent otitis media and mastoiditis was the Diplococcus pneumoniae Type 3 infection. In this there is an initial phase of edema and scant secretion, a rarefaction of bone, condensation of organized fibrous tissue, and, finally, ossification.

To make a comparable histologic evaluation of middle ear and mastoid changes occurring in those cases treated with antibiotics, bone chips removed from such cases advancing to surgery, despite therapy, were studied. The various phases of reaction seen in such material make good examples for histologic comparison with the known pathology of latent otitis media occurring in the pre-antibiotic era, and give knowledge of the type of reaction that occurs in those antibiotic-treated cases that do not come to surgery.

In studying the material there are found to be almost identical histologic changes in the antibiotic treated "masked" otitis media and in the Diplococcus pneumoniae Type 3 infections. In both there is abundant fibrosis. Production and condensation of collagen are prominent. The pneumatic cells become constricted by the formation of new bone at the walls of the cell, and production of rootstock bone in the center of the cell. The period of bone rarefaction appears to be shortened or absent. In Diplococcus pneumoniae Type 3 infections the latency is interrupted with the disappearance of the "slime layer" of the capsulated coccus; in otitis treated with antibiotics it is interrupted through a superinfection, or by reactivation of resistant strains of bacteria, and by as yet unknown enzymatic action.

The clinical course of otitis media treated but uninfluenced by antibiotics is entirely different from the course of trivial otitis media. The period of latency may extend for weeks and months, with more general than local symptoms, and usually becomes manifest with symptoms of intracranial involvement.

—Fletcher Austin, M.D.

EYE

Ocular Histology in Premature Infants with Reference to Retrolental Fibroplasia. B. A. WARD. *Brit. J. Ophth.*, 1954, 38: 445.

THE AUTHOR reports the results of his studies on 100 eyes of premature infants examined histologically in search of early signs of retrolental fibroplasia, and of physiologic or pathologic conditions which might predispose to this disease. Attention was directed chiefly to retinal vascularization and coaptation. By comparing the characteristics of cases showing variation of these processes with the average characteristics of the eyes of 100 premature babies, an attempt is made to clarify the significance of these variations with particular reference to retrolental fibroplasia. The literature on the subject is reviewed. Of the 100 eyes, 13

were of stillborn babies, 26 were of premature infants living less than 1 day, 47 were of those living less than a week, 9 were from infants living more than a week, and 5 were of unknown age or weight.

The method of examination and the findings are described in detail and illustrated with photomicrographs. The data show that in the retinae of 13 per cent of premature babies there are signs of an unusual degree of angioblastic activity indicated by increased quantities of vasoformative tissue in the nerve fiber layer; it is commonest in the lower weight group and is associated with incomplete retinal vascularization. The possibility that these changes might have been found in 100 per cent of the eyes had they been examined by the method of serial sectioning cannot be eliminated. Arising from the more developed vessels or at the growing margin, all gradations of vascular proliferation were encountered in this material, from the normal to the extreme, the differences being broadly of degree and situation. This change was associated with no characteristic of retrolental fibroplasia apart from low birth weight, and there was no evidence to suggest that it was beyond the upper limit of normality. Separation of the clear from the pigmented cells of the pars plana and of the clear and pigmented cells from the basement membrane, and the frequent retinal folds were thought to be artefacts attributable to differential shrinkage of the coats of the eye, indicating only that adhesion between the layers of the optic cup is poorly developed in the premature eye. The author considers that he found no evidence of retrolental fibroplasia in this material, apart from the incomplete retinal vasculature which is characteristic of prematurity. —*Ray Karchmer Daily, M.D.*

The Incidence and Severity of Retrolental Fibroplasia in Relation to Possible Causative Factors; Observations on the Occurrence of Retrolental Fibroplasia; Studies of the Relationship of Retrolental Fibroplasia to the Degree of Prematurity, Oxygen Therapy, General Health, and Date of Birth of Premature Infants. LEONA ZACHARIAS, WILLIAM E. REYNOLDS, JULIAN F. CHISHOLM, JR., and MERRILL J. KING. *Am. J. Ophth.*, 1954, 38: 317.

THE AUTHORS point out that retrolental fibroplasia is a disease of the retina and vitreous which occurs almost exclusively in premature infants of low birth weight.

During the past decade this disease has become the most common cause of blindness in the infant.

The sudden appearance of this disease in previously unaffected areas and the changes in its incidence rate suggest that its causative agent might be found in factors which became operative at the same time.

Current investigation into the cause of retrolental fibroplasia deals with various aspects of nursery management which were introduced or altered, and the relationship of this disease to degree of prematurity, oxygen therapy, general health, and date of birth of premature infants.

In an 11 year period 25 per cent of the infants weighing less than 3 pounds developed retrolental fibroplasia, whereas only 14 per cent of the heavier infants did so.

Some investigators believe that the disease is initiated by an insufficient supply of oxygen; others believe that an excess of oxygen is responsible. In the group with oxygen therapy of long duration, the incidence of retrolental fibroplasia was 29 per cent in comparison with an incidence of only 6 per cent in the group having oxygen therapy of short duration.

The major fluctuations in the incidence rate of retrolental fibroplasia have not paralleled the annual changes in the use of oxygen, in spite of the fact that the use of oxygen did increase during the period of years in which retrolental fibroplasia reached its highest incidence.

The corresponding incidence rates of retrolental fibroplasia for infants with long and short nursery stays were 21 per cent and 11 per cent, respectively.

A follow-up study of infants weighing 4 pounds or less at birth, from 1949 through 1952, was made. This report (in two parts) deals with infants of a birth weight of 4 pounds or less, admitted to the premature nursery of the Boston Lying-In Hospital. The first part describes the changes in size of this group of infants. The second part deals with the incidence and severity of retrolental fibroplasia in this group, for the years 1938 through 1952, in relation to birth weight, gestational age, length of nursery stay, duration of oxygen therapy, and time of birth. The study is retrospective for the period 1938 through 1948; the data were obtained in a follow-up program for the remaining 4 years, 1949 through 1952.

During the 19 year period (1934 through 1952) the incidence rate of premature live births, 4 pounds or less in weight, increased about two-fold at the Boston Lying-In Hospital; there was more than a threefold increase in the number of infants weighing 4 pounds or less at birth who were discharged alive from the premature nursery.

The second part of the study revealed that two measures of prematurity (birth weight and gestational age) vary inversely with the incidence and severity of retrolental fibroplasia; the two environmental factors (duration of oxygen therapy and length of nursery stay) vary directly not only with the incidence but also with severity of the disease.

On the basis of the quantitative data in the follow-up study (1949 through 1952), the inverse relationship of gestational age to the occurrence and severity of retrolental fibroplasia is the most consistent.

It was found that two changes in the care of premature infants had occurred at the beginning of 1949, viz., (1) the initiation of a program of repeated periodic ophthalmoscopic examinations; (2) a change from the Hess type of bed to the Gordon-Armstrong incubators (which requires the raising of the entire top each time the infant is handled) so that the oxygen concentration is lower and less constant than that in a Hess bed.

The most convincing evidence reported so far for a causal relationship between oxygen administration and retrolental fibroplasia has been offered during the last 3 years by the controlled animal experiments of Ashton *et al.*, Gyllensten and Hellstrom, and the controlled studies on human infants by Lanman *et al.*, and Patz *et al.* Clinically it should be demonstrable that reducing the concentration of oxygen and shortening the duration of therapy in premature infants are followed by a reduction in the occurrence of the disease.

It is concluded that although the duration of oxygen therapy is one of a few factors related not only to the incidence but also to the severity of retrolental fibroplasia, the data in the present article fail to support the idea that oxygen therapy, when measured as duration, is a major or even a necessary causal factor in the occurrence of this disease. It is conceivable that the relationship of oxygen therapy to retrolental fibroplasia is more dependent on other factors such as concentration or time of exposure than on the duration of therapy. —*Joshua Zuckerman, M.D.*

Cicatricial Stage of Retrolental Fibroplasia. ALGERNON B. REESE and JOSEF STEPANIK. *Am. J. Ophth.*, 1954, 38: 308.

THE AUTHORS analyze the data obtained on 672 babies examined under general anesthesia. The data relative to stages of the disease are tabulated according to birth weight, changes in the anterior chamber, synechia, glaucoma, the presence of ciliary and dentate processes, cataract, fundus appearance, the presence of retinal folds, and vision. The fundus findings were classified according to the classification recommended by the Joint Committee on Retrolental Fibroplasia of the National Society for the Prevention of Blindness.

Of the 1,344 eyes examined, retrolental fibroplasia was definitely established in 1,277 eyes. The largest number of cases was among infants weighing 2 to 3 pounds and 3 to 4 pounds. There were 36 eyes with retrolental fibroplasia in 20 infants with a birth weight of between 5 and 8 pounds, indicating that the disease does occur in infants of normal birth weight. In 62 per cent of the eyes examined, the fundus showed changes of grade 4 of the cicatricial stage, with retrolental tissue covering part of the pupillary area. Thirty-two eyes were found normal even after an exhaustive examination, which indicates that the disease may be unilateral, although the fact that it occurred but left no demonstrable sequelae should be considered as a possibility.

Microphthalmos was noticeable in the more advanced cases, and was found to be related to the severity of the disease. The stages of the disease were equal in 386 infants, and different in 258; the poorer eye was the right eye in 149 infants, and the left eye in 109 infants.

Corneal scarring was found in 99 eyes, and it was invariably in the advanced grade 5. Corneal scarring occurs as the result of the advancement of the iris forward, when the anterior chamber becomes very shallow. The occurrence of glaucoma, which is confined almost entirely to grade 5, appears in most instances concurrent with the progressive shallowing of the anterior chamber. Glaucoma appears to be usually of a transitory nature, and runs its course between 3 months and a year, and is then frequently followed by atrophy of the globe. Ciliary processes are constantly seen around the periphery of the retrolental tissue in grade 5 of the disease. Cataract plays an inconspicuous part in the disease. Some grade of enophthalmos is usually noted in grade 5. The location of the fundus lesions in grade 1 and 3 cases is on the temporal side of the eye. A pigment conus at the disk margin is constantly seen on the nasal side, opposite the side of the fundus affected. Holes of rarefied areas may appear in the retina over the detached areas in grades 1 and 3.

The vision in grade 1 was 10/20 to 20/70; in grade 2, 20/70 to 10/70; and in grade 3, 10/70 to 3/200. The refractive error was usually from 4 to 8 diopters of myopia. Rarely, further loss of vision occurs late as a result of cataract or further retinal detachment secondary to hole formation.

—*Ray Karchmer Daily, M.D.*

Oxygen Studies in Retrolental Fibroplasia; Clinical and Experimental Observations. ARNALL PATZ. *Am. J. Ophth.*, 1954, 38: 291.

THE AUTHOR PRESENTS a detailed report of a controlled study on infants, and a summary of a former report containing experimental data on animals, with the objective of elucidating the etiogenesis and the pathogenesis of oxygen in retrolental fibroplasia. The study on infants extended over a period of 25 months and the material comprises 120 infants. The results of this controlled clinical study supported by the experimental data on animals establish the important role of overuse of oxygen in the development of retrolental fibroplasia.

The author's data refute Szewzyk's claim that high oxygen per se is nontoxic to the premature retina. While the withdrawal from oxygen is not essential for the oxygen to be injurious, the data suggest that rapid withdrawal from a high oxygen concentration during a stage of marked retinal vasoconstriction inflicts additional injury by a state of retinal anoxia resulting until the retinal blood flow has been reestablished. The author disagrees with Szewzyk on the treatment of retrolental fibroplasia with oxygen, and considers its administration in high concentration, in the absence of cyanosis, dangerous.

The experimental studies on animals have produced ophthalmoscopic changes justifying the conclusions that they represent the same changes seen in retrolental fibroplasia in the human. The clinical implications of these studies justify an urgent plea that oxygen therapy be rigidly curtailed in the premature nursery and its overuse cautiously avoided; that the medical and nursing staff be thoroughly indoctrinated on the dangers of overuse of oxygen; that except for emergency use oxygen therapy should require a specific order; that every nursery should be equipped with an oxygen analyzer; that oxygen therapy be ordered by concentration rather than rate of flow; and that oxygen concentrations be measured and recorded at least once daily. —*Ray Karchmer Daily, M.D.*

Modification in Intraocular Acrylic Lens Surgery. T. G. WYNNE PARRY. *Brit. J. Ophth.*, 1954, 38: 616.

BECAUSE the author is of the opinion that intraocular acrylic lens surgery is bound to become an accepted procedure, he has simplified the operation to further this end. He suggests performing a complete iridectomy (so that manipulation of the lens through a round pupil will be avoided) and an intracapsular instead of an extracapsular extraction (provided that the dangers of prolapse of the lens into the vitreous at operation, or later, can be done away with).

He uses a modified form of the acrylic lens in which two small triangular pieces are cut from the rim of the

lens and the part of the lens between these two areas is drilled through from side to side. A fine tantalum wire is then threaded through the drilled hole and the ends are bent upward and then backward. They are smoothed down on the sclera and secured under the corneoscleral suture when that is tied. The conjunctival flap is then sutured down over the tantalum. The acrylic lens then seems safely fixed in place so that it will not prolapse into the anterior chamber or into the vitreous.

In the case reported there was the usual reaction and the pupil became occluded. When the reaction finally subsided and the patient was eventually supplied with lenses, vision reached 6–6 partly and Jaeger 1.

—Joshua Zuckerman, M.D.

Vascular Anatomy of the Choroid in Relation to Selective Localization of Ocular Disease. KENNETH C. WYBAR. *Brit. J. Ophth.*, 1954, 38: 513.

AN OUTSTANDING FEATURE of choroidal disease is that the lesions frequently remain remarkably circumscribed. The author performed experiments to determine whether a relationship exists between the vascular anatomy of the choroid and the selective localization of pathologic changes within the choroid. Neoprene latex casts of the choroidal vessels of the human eye were prepared by the intravascular injection technique of Ashton. By using neoprene instead of dyes, dissection of individual vessels or capillary areas from the main vascular mass is made possible, so that the vascular anatomy can then be studied in detail using a wide-field stereoscopic microscope with direct illumination.

Previous theories in the literature include the theory of division into sectors and the theory of division into zones.

According to Wagenmann (1890), the short posterior ciliary arteries are functional end-arteries and the vessels within the choroid have a strictly segmental distribution. Leber's study (1903) of the choroidal circulation contributed to this concept. Clinical observations have tended to substantiate Wagenmann's findings of a segmental pattern of the choroidal vascular supply by Coats (1907) and Hepburn (1912).

In addition to the concept that the choroid is divided into discrete radially arranged sectors, extending from the peripapillary region to the peripheral limit of the choroid, the theory of division into distinct zones within the choroid has been postulated. These include the equator, the periphery, the region underlying the macula, and the peripapillary zone.

All this evidence forms an attractive thesis in considering the selective localization of choroidal disease, but certain findings are opposed to such a concept.

There is doubt that the arteries in the choroid have the characteristics of end-arteries; that the equator is a specialized area of the choroid, in that it represents a zone of ineffective anastomoses between the posterior and recurrent choroidal circulations; that the periphery of the choroid is a distinct zone isolated from the rest of the choroid; that the choroid underlying the macula has distinctive features, at least as far as its capillary layer is concerned; and that the peripapillary region of the choroid is supplied by an exclusive system of arteries divorced from the rest of the choroid.

Examination of the casts of the choroidal vessels prepared by neoprene latex which possesses cohesive and elastic properties (so that not only individual vessels but also isolated capillary areas could be dissected from the main vascular mass) revealed that:

1. The short posterior ciliary arteries are segmentally arranged, and each branch supplies a localized zone of the choroid with an arteriolar-capillary network, but there is no anatomical evidence to support the concept that these arteries are true end-arteries.

2. The meeting place at the equator of the posterior choroidal circulation (short posterior ciliary arteries) and the anterior choroidal circulation (recurrent arteries from the major arterial circle of the iris, from the long posterior ciliary arteries, and from the anterior ciliary arteries) may be marked by an intervening capillary network. However, many of the vessels in the anastomosing circulations are in direct continuity with one another in contradistinction to the view that the equator is a zone of defective choroidal vascularization, as well as to the view that the anterior part of the choroid is isolated from the rest of the structure.

3. The size and density of the vessels in the choriocapillaries vary in different regions according to their distance from the optic disc. However, there is no evidence to support the view that the choriocapillaris underlying the macula has distinctive anatomical features.

It is concluded that there is no anatomical evidence to suggest that the selective localization of choroidal disease is purely an expression of the anatomical peculiarities of certain vascular districts.

—Joshua Zuckerman, M.D.

Oxyphenonium (Antrenyl); a Potent Atropine Substitute. WILLIAM H. HAVENER and HAROLD F. FALLS. *Arch. Ophth.*, Chic., 1954, 52: 515.

ANTRENYL is stable in both tablet form and in aqueous solution. The daily instillation of 5 per cent antrenyl in the eyes of rabbits for several months caused a transient conjunctival exudation, but otherwise did not produce any injurious ocular effect, nor did sensitivity ever ensue. In this species the mydriatic effect of antrenyl is more marked and prolonged than that of atropine. For human eyes the 1 per cent antrenyl seems optimal as it does not cause smarting nor conjunctival discharge and the effect is comparable in degree and duration to that of 1 per cent atropine.

Twelve patients with marked ocular sensitivity to atropine were treated with 1 per cent antrenyl and not one exhibited cross sensitivity to antrenyl, nor did any develop antrenyl allergy. Antrenyl may be used as an effective substitute for atropine in ophthalmic therapy.

—James E. Lebensohn, M.D.

MOUTH

Face Injury in Sport. JOHN GERRIE. *Plastic & Reconstr. Surg.*, 1954, 14: 224.

FACE INJURY in sport seems to be the least serious aspect of sport injury and the face injuries that do occur are not of a serious or deforming type, excluding injuries of the eyes, which are not included in this series. One-hundred and fifty consecutive sport injuries in-

volving the face have been analyzed from the point of view of the sport responsible, and the bones and structures involved. These cases have been collected in four Montreal hospitals, one of which is situated directly opposite and has the opportunity of treating any serious injuries which occur in the Montreal Forum, a sports arena which houses most major indoor sports events in Montreal. Very few serious face juries occur here.

The order of frequency of the various sports involved follows: hockey is responsible for 41 per cent; football, 11.5 per cent; softball, 11 per cent; baseball, 6 per cent; boxing, 6 per cent; swimming and skiing, 5 per cent each, soccer, 3.5 per cent, and other miscellaneous sports, 10 per cent. The anatomical feature involved revealed that the nose was fractured in more than half the cases, or 63 per cent; mandible, 17 per cent; malar bone, 14 per cent, maxilla, 1 per cent; zygoma, 2 per cent; and soft tissue, in 3 per cent. The nose fractures were mostly of the lateral impaction type. Only 9 were of a serious head-on injury. For the most part, all the injuries were "run of the mill types" and presented no special problems.

In the treatment of athletic injuries, the time out of play must be considered. At the present time the feeling is that most coaches want their players 100 per cent fit before returning to play. For a broken nose, cheek bone, or zygoma, where the injury is reduced early and requires no external splinting, the author allows return to play in 10 days, with protective headgear in football linesmen, but no protective headgear in backfield men or hockey players, in whom there is need for freedom of head movement and vision. In other sports, except for football and hockey, there is no indication for face protection.

The frequency of the different types of face injury occurring in sports is also compared with 500 cases of face injuries from all causes, and there appears to be very little variation with the exception of fractured malar bones, which are observed more frequently in sports injuries.

In conclusion, it must be remembered that this survey is geographic and tinted by a 6 months' participation in vigorous winter sports.

—*Carl Schiller, M.D.*

Nevi and Melanomas of the Face. Herbert Conway and Anthony P. Jerome. *Plastic & Reconstr. Surg.*, 1954, 14: 200.

The authors discuss the histogenesis of pigmented nevi and emphasize evidence that malignant melanomas originate only from nevi which show junctional changes. The junctional nevus is recognized as a flat, hairless, dark nevus. However, elevated or hairy nevi may contain junctional changes, and therefore the precursory nevus of melanoma cannot be recognized by clinical examination. The use of the cautery, electric needle, desiccation, carbon dioxide snow, acids, and caustics in the treatment of nevi is definitely condemned, for in addition to loss of the specimen, these procedures may invite malignant change. Physical alterations such as increase in size, pigmentation, pain, itching, bleeding, ulceration, or crusting are almost diagnostic of malignant transformation of a nevus. The stimulation to such change is not definitely established. Trauma and exposure to sunlight are strongly considered factors. Hormones are believed to accelerate rather than initiate the process.

If these changes occur, the diagnosis of melanoma is fairly certain. If biopsy is decided upon, excisional rather than incisional biopsy is recommended. Incisional biopsy is condemned for fear of spreading the lesion through blood channels. The same contraindication holds for aspiration biopsy of primary lesions or nodes, also for local anesthesia in this condition.

Malignancy arising in the nevi of the skin of the head and neck comprise 30 per cent of all cases of melanoma, which is far out of proportion, since this region represents less than 10 per cent of total skin surface. In Pack's series, the 5-year cure rate for lesions in this region is only 18 per cent, just slightly higher than that of melanoma of the scrotum, which has a cure rate of 16 per cent. The low rate of cure of melanomas in the head and neck region probably is due in part to the fact that radical surgical excision of the lesion in this region is more limited than in other parts of the body.

Since there has been considerable improvement in the survival rate following radical excision of melanomas and regional nodes in continuity of the torso and extremities, as performed in recent years, the authors believe that the same principles should be used in the management of these lesions in the head and neck. Well illustrated photographs demonstrate the technique of radical excision of melanoma of the cheek and cervical lymph nodes with dissection in continuity, and closure with the aid of thick split skin grafts.

—*Carl Schiller, M.D.*

Fractures of the Mandibular Condyle; a Method of Nasomandibular Fixation in Children and in Edentulous Adults. Thomas Ray Broadbent. *Plastic & Reconstr. Surg.*, 1954, 14: 148.

Since the condylar neck is the weakest part of the mandible, unilateral or bilateral condylar or subcondylar fractures are not uncommon following blows on the chin. Firmly attached adult teeth allow safe, secure immobilization, but in children or in edentulous or nearly edentulous adults other sources of anchorage must be sought. In children, temporary teeth with simple root attachments may be loosened or lost by the abnormal pull of immobilization. Nasomandibular wiring is presented as a safe effective method of fixation in these two groups.

Preferably, under local anesthesia, and with use of a number 18 spinal needle, a single number 25 stainless steel wire is placed circumferentially around the mandible in the midline. An incision is made in the midline of the upper lip adjacent to the sulcus, and the nasal spine is exposed and perforated near its base. The wire is passed through the spine and the ends twisted tightly to bring the mandible into occlusion. The wire may be tightened as needed and immobilization maintained for 4 to 5 weeks. When general anesthesia is used, the wire ends are not twisted until the next day.

The author reports the effective use of this procedure on children under the age of 7. In one case the wire pulled out of the nasal spine but a second wiring closer to the base of the spine proved effective. Six

edentulous or nearly edentulous adult patients were treated successfully with a single nasomandibular wire.

The author believes that an individual with contact between one or two teeth has sufficient space maintenance; however, security can be added and lateral motion decreased by an acrylic or dental compound splint. —*Earl H. Klabunde, M.D.*

NECK

Papillary Adenocarcinoma of the Thyroid; So-Called "Lateral Aberrant Thyroid." REGINALD WEBSTER and RUSSELL HOWARD. *Austral. N. Zealand J. Surg.*, 1954, 24: 1.

ALTHOUGH references to the cervical nodules which subsequently became known and accepted as "lateral aberrant thyroids" have been traced back as far as 1799, the earliest detailed account that these authors have been able to locate appeared in 1896. It is interesting to read, in the Transactions of the Pathological Society of London for that year, of the presentation by A. E. Barker of clinical and operative details concerning a "cystic accessory thyroid body"; of four operations in 6 years for the excision of recurrent growths; of Barker's description of intracystic papillary formations in the original tumor; of his identification of the very large neoplasm with the thyroid by evidence provided by histologic sections; of the precise reproduction of the structure of the original growth in the masses removed at each of the several operations for recurrence; and of his expressed opinion that the primary tumor was undoubtedly derived from an accessory thyroid gland. This report also records that Barker's earlier confidence that the recurrent nodules were secondary deposits in lymphatic glands, and his acceptance of the implied malignancy of the original tumor, later gave way to doubt induced by consideration of the general well being of the patient 16 years after the appearance of the neoplasm in its small inception, and by the lack of evidence of involvement of organs more distant than the cervical lymphatic glands 6 years after the first and major operation.

This well-attested account of cystic papillary adenocarcinoma of the thyroid described the histology in a manner which left little as gleanings for histopathologists of later years. It featured the protracted clinical course and emphasized the predilection of metastases of the cervical lymph nodes, to the apparent exclusion of dissemination further afield. It left undetermined the mode of origin of the tumor and formulated as the principal problem involved the decision as to whether it arose in the thyroid proper or sprang from an outlying islet of thyroid tissue—a problem now resolved in favor of the former alternative, at least in the overwhelming majority of instances.

Five case reports are presented. Three of the patients were children and 2 were adults.

In the first case, that of a 29 year old woman, a blood-colored mass was removed from the left side of the neck just below the lower portion of the sternomastoid muscle. There had been no enlargement of the thyroid gland. The mass was considered to be a papillary adenocarcinoma of the thyroid and hence a unilateral thyroidectomy was accomplished. The patient was given deep x-ray therapy immediately after thyroidectomy, and in a few weeks a palpable enlargement of other nodes in her neck prompted reoperation. Several nodes were removed from the carotid sheath region on this same side of the neck and these were all involved in the neoplastic process. The patient was apparently well 6 years after the original operation.

The second patient, a 39 year old man, was operated upon for cervical masses with a palpably enlarged unilateral thyroid. A unilateral thyroidectomy was accomplished and at that operation a severe involvement of the neighboring lymph nodes was encountered. Not only was that side of the neck heavily populated with these involved nodes, but also several nodes on the under surface and the medial surface of this involved lobe of the thyroid were found and the recurrent laryngeal nerve was definitely involved by one of these malignant nodes. A section of the nerve consequently was removed and microscopic section of this nerve showed invasion of the nerve sheath by the malignant nests. Five years later, after intensive deep x-ray therapy, the patient was well but was still having difficulty with phonation. In this case the excised lobe of thyroid showed a malignant focus that was quite identical with the neoplastic process in the scattered lymphatic nodes.

The third patient, a girl 12 years of age, had been observed for 2 years preceding her entrance to the clinic because of recurrent swellings on both sides of her neck. The lumps were first discovered shortly after an attack of mumps and were more conspicuous on the left side than the right. In the ensuing months the swellings waxed and waned under observation; no basis in blood dyscrasia, glandular fever, or tuberculosis could be substantiated and eventually the patient was sent to the clinic for lymph node biopsy. One of the prominent nodes was studied and a clear diagnosis of papillary adenocarcinoma was made. Presently the left lobe of the thyroid was removed together with a group of enlarged and obviously affected lymph nodes from the lower half of this side of the neck, where they lay behind the sternomastoid. The isolation and preservation of the recurrent nerve involved a tedious and difficult dissection, embedded as it was in a mass of enlarged and closely attached lymph nodes; nevertheless the postoperative laryngoscopic examination was normal.

A week later the right lobe and all such lymph nodes as could be determined as implicated on the right side of the neck were excised. The third operation, performed 2 weeks later, went back to the left side of the neck and a chain of lymph nodes (some of which were very large) along the course of the internal jugular vein from the mastoid process to the field of the first operation, was removed.

The girl was discharged on 1½ gr. of thyroid extract daily. At no time did she exhibit any sign of thyroid deficiency. She is now a big strong girl, has passed through puberty, and her thyroid requirements are met by the daily administration of 2 gr. of thyroid extract.

The fourth patient, a 14 year old girl, was first seen because of multiple masses on both sides of her neck. These swellings had gradually increased in size and number during a period of 4 years. In order to obtain

a diagnosis, in which Hodgkin's disease seemed likely, one of the nodes was removed for study and a diagnosis of cystic papillary adenocarcinoma of the thyroid was made. A preoperative chest film showed the presence of a mass encroaching on the right lung field from the superior mediastinum, even though the lung fields themselves were clear. The first operation was done shortly thereafter and at this time the right lobe of the thyroid gland was removed and an aggregate of malignant lymph nodes was tediously excised. At this operation a large retrosternal mass, subsequently determined as neoplastic, was removed and along with it a cluster of malignant lymph nodes extending from it to the thyroid gland. Ten days later a second operation cleared away the residual enlarged nodes on the right side of the neck. Postoperatively a paralysis of the right vocal cord was found.

Seven weeks later the left lobe of the thyroid was removed. Enlarged and malignant looking lymph nodes were dissected from the vicinity of the laryngeal nerve on this side and also from the anterior triangle of the neck. Two weeks later the patient was very well, though her voice was extremely weak. When seen in 1 year and 10 months after her first operation she was well, and no further cervical nodules could be palpated. The girl eventually recovered her voice, and successfully came through the period of adolescence. A dose of 1½ gr. of thyroid extract daily has been found sufficient to maintain her in thyroid equilibrium. Calcium deficiency, manifested by paresthesia and nervous irritability, rendered medication necessary during the months succeeding her several operations, but the untoward symptoms gradually subsided.

The last patient was a 9 year old boy who was first brought to the physician because of the presence of two enlarged nodes in the right side of his neck. These nodes, which were freely movable, lay beneath the sternomastoid and just above the sternal end of the right clavicle. A biopsy was made of one of these nodes and it was apparent that it contained an epithelial tumor, which varied in structure from a simple arrangement of alveolar spaces lined by low columnar or cuboidal epithelium to a cystadenomatous pattern in which papillary processes covered by frankly columnar epithelium projected into cystic spaces. The malignant quality of the tumor, suggested strongly by the clinical facts and its lymphoid environment in microscopic section, was difficult to discern but looked very much like carcinoma simplex. Inasmuch as this boy's chest plate showed questionable metastatic lesions, no radical extirpative surgery was carried out in his neck, and repeated x-ray films through the years showed a definitely but slowly progressive lesion throughout the lung field. Ten years have elapsed from the time this boy was first seen and it seemed apparent from the duration of life that this lesion probably represented a metaplasia of an original thyroid malignancy. —*Matthew H. Evoy, M.D.*

Bilateral Glomus Caroticum Tumor. A. D. VERHAGEN. *Arch. chir. Neerl.*, 1954, 6: 12.

THIS article is primarily a vehicle to describe a case of bilateral glomus caroticum tumor. The literature has been developed very thoroughly, and many of the previous series of cases are discussed. Special attention has been given to the possibility of both a malignant or benign tumor of this type.

This author, with 1 case, summarizes all of the findings in many previous case reports. His patient was a 27 year old woman with bilateral glomus caroticum tumor. At the time of the last report the patient was well following surgery.

—*Richard J. Bennett, Jr., M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Extradural Hemorrhages of the Posterior Fossa. R. S. HOOPER. *Brit. J. Surg.*, 1954, 42: 19.

THE AUTHOR PRESENTS 7 cases of extradural hemorrhage of the posterior fossa following craniocerebral injuries, obtained from a series of 47 extradural hematomas. He discusses the clinical and roentgenologic features of each case and describes the operative intervention used.

According to the rapidity with which the symptoms progress, he distinguished between an acute form, a subacute form, and a chronic form. In the acute form, the signs of medullary compression occur within 24 hours after injury; in the subacute form, manifestation of brain stem compression is delayed from 2 to 7 days, while in the chronic form acute manifestations occur after a period of some weeks.

Two of the cases presented rapid development of medullary compression following a blow on the posterior portion of the head. Deterioration of consciousness is progressive, and usually the first alarm signal. The patient may have neck rigidity and pain in the suboccipital region; profound coma arises rapidly and death may occur suddenly from respiratory obstruction. The subacute form includes 4 cases which also presented a history of posterior impact, evidence of fracture involving the posterior fossa, neck rigidity, gradual deterioration of consciousness, hypertonia of the limbs, diminished reflexes, and pathologic plantar responses. The patient showed pupillary inequality and paralysis of ocular movements which he ascribes to an upward herniation of the cerebellum through the hiatus of the tentorium.

The patient with chronic hematoma presented symptoms of persistent headaches and later signs which could be associated with tumors of the posterior fossa such as papilledema and ataxic gait.

In all cases the impact was received in the posterior half of the head and a fracture was present in the occipital bone usually crossing the venous sinus. Early roentgenography was found to be of utmost importance, as the identification of a fracture in the occipital region would suggest the possibility of an extradural hemorrhage in the posterior fossa. Neck rigidity is a fairly constant sign. Vomiting and headaches are frequent. Progressive stupor and coma accompanied by respiratory difficulties and failure are suggestive of progressive medullary compression.

Evacuation of the hematoma is made through a paramedian vertical incision over the posterior fossa and an underlying enlarged burr hole. Any tear in the sinus is covered with crushed muscle and the laceration oversewn with fine silk sutures. If this is not possible the surrounding dura is fixed against the overlying bone edge by sutures placed in the dura and the overlying pericranium or muscle.

Three of the patients died of respiratory failure. The prognosis depends primarily upon early diagnosis and operation without delay. —*George Perret, M.D.*

Pituitary Changes Following Electrocoagulation (Hypophysenveraenderungen nach Elektrokoagulation). F. LEICHER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 301.

STIMULATED BY KIRSCHNER'S PERCUTANEOUS ELECTROCOAGULATION of the Gasserian ganglion in 1931, K. H. Bauer used the technique for coagulation of the pituitary gland and reported good results which he published jointly with Klar in 1952. The paramedian transethmoidal route was preferred to the originally chosen transcranial approach. The pituitary adenoma was coagulated in a diameter of at least 1 cm. and Bauer and Klar assumed that sufficient cells would survive in the marginal zone.

Bauer extended this method to combat other malignant tumors on the assumption that after partial elimination of the pituitary hormones the tumor cells would be inhibited from growing.

The author examined the pituitary gland of a patient treated by Bauer. The patient was a man, 30 years of age with a melanotic nevus behind the ear. This tumor was removed by a barber by high frequency fulguration. Within 2 years metastases developed. A transethmoidal electrocoagulation of the pituitary gland was done which did not stop tumor growth, and approximately 4 months later the patient died. Extensive involvement of the cervical, thoracic, peripancreatic, periportal, mesenteric, and retroperitoneal lymph nodes was found in addition to the diffuse hematogenous spread of metastases in the subcutaneous tissue, lungs, heart, kidneys, brain, intestine, gallbladder, mesentery, omentum, thyroid, and adrenal glands.

The pituitary gland showed a pseudocyst, not lined by epithelium; it measured 5 by 7 mm. and tapered off toward the neurohypophysis. There was a perifocal zone of detritus and hemosiderosis on the capsule. Minor damage was visible in the posterior lobe. The orbital surface of the frontal lobe along the olfactory nerve also showed signs of thermal damage.

The pseudocyst could be differentiated from other conditions, such as pseudofollicles of Kraus, cysts of Rathke, and reflection cysts of Romeis, by the following facts: (1) the cyst was located in the anterior part of the anterior lobe of the pituitary gland, leaving the zona intermedia intact; (2) there was no epithelial lining; and (3) there was a capsule consisting of granulation tissue with scarring and hemosiderin pigment.

Thus, this pseudocyst had been produced by the effect of the electrocoagulation. The marginal fibronoid changes indicated colliquation necrosis. One-third of the adenohypophysis was destroyed by the electric current. The surrounding zone of detritus indicated serious damage to the neighboring parenchyma. Eosinophilia of the remaining parenchyma may have been the result of atrophy of other incretory organs, especially the testes. While fresh hemorrhages in the granulation tissue are explained on the basis of circulatory disturbances, caused by intracranial metastases, hemosiderin deposition is the direct effect

of coagulation. The neurohypophysis showed only minor regressive changes and seemed to be more resistant to thermal damage. It was hard to assess how much compensatory hyperplasia was responsible for the parenchymatous residuals seen at both sides of the cyst.

Although the approach was extracranial and the electrode did not reach the sella; the goal of the operation was fully reached locally, yet a favorable effect on tumor growth was not achieved.

—*Ernest Bors, M.D.*

SPINAL CORD AND ITS COVERINGS

Injuries of the Spinal Cord. L. W. FREEMAN. *Surg. Clin. N. America,* 1954, 34: 1131.

THE author discusses the problem of injury to the spinal cord with particular reference to the advisability of operative intervention. The various reasons for nonoperative treatment are presented. Subsequently a discussion of the acute pathophysiology of the spinal cord is outlined and a classification of spinal cord injuries is presented. This includes concussion, contusion, and laceration. The various methods of production of these injuries is further enlarged upon with particular reference to specific types of trauma.

Metabolic alterations associated with spinal cord injury include a rapid catabolism of protein marked by an increase in the output of nitrogen in the urine and by a fall in the serum protein, which are followed by a drop in the protein stores of the body and a fall in the total circulating hemoglobin. These changes at times are sufficient to require transfusions and indicate the need for strict attention to nutritional needs, particularly with reference to a high protein intake. The problem of decubiti seems to be closely connected with the nutritional factor, in addition to the mechanical aspects of local pressure.

Operative treatment is considered and it is pointed out that in lumbar lesions one is dealing with the cauda equina, a peripheral nerve structure with powers of regeneration and which may lend itself to recovery with adequate surgical decompression and repair.

The author thinks that in dorsal and dorsolumbar injuries there is often bony displacement and direct pressure upon the cord despite x-ray evidence to the contrary. Operation is frequently believed advisable for these patients despite essentially complete lesions. Some details of the author's technique in laminectomy are outlined.

Although traction is considered in cervical injuries, the author apparently is again in favor of operative measures and has advised local anesthesia in this area. He thinks that the pia mater should be incised and a median myelotomy done in an attempt to assist cord recovery.

Additional details of care, including that of the bladder and bowel, are also discussed.

—*Howard A. Brown, M.D.*

Medullary Alterations After Experimental Interruption of the Aorta (Le alterazioni midollari dopo interruzione sperimentale dell'aorta). N. COCCHIA and G. ANGRISANI. *Ann. ital. chir.,* 1954, 31: 345.

IN THESE EXPERIMENTS, the physiologic and histologic changes in the anterior horn cells were studied after ischemia had been induced for varying periods by experimental ligation of the aorta. In a series of 22 dogs the aorta was temporarily occluded in either its thoracic or abdominal portion.

From these experiments it was evident that there was no interruption of function and no apparent histologic changes when the aorta was interrupted for period up to 15 minutes. When the period of ischemia was prolonged for 20 minutes, the animals were still able to move both lower extremities on recovery from surgery.

Histologic studies of the spinal cord, 24 hours after surgery, showed that there was almost complete chromatolysis. The nuclei were peripherally placed and the nucleolus was elongated and dense. In animals in which the period of ischemia was prolonged to 33 minutes, there was a complete paraplegia with loss of bowel and bladder control. Histologic studies 6 hours after surgery revealed that there was a granular appearance to the anterior horn cells and in some there were deposits of Nissl granulations.

In 1 animal the period of ischemia was prolonged for 45 minutes. There was complete paraplegia on recovery from the operation. Twelve days after surgery, the spinal cord was studied but there were no discernible specific changes from the normal spinal cord. In another animal paraplegia was induced after 50 minutes of ischemia. The spinal cord was studied after 6 days, and a prolongation of the dendrites and a tortuosity to the nerve fibers were noted. In the last animal studied, paraplegia was induced after a 55 minute period of ischemia. The spinal cord was studied 3 hours after surgery and a severe chromatolysis of the anterior horn cells was noted. The involvement was diffuse with a tendency of these cells to become elongated.

From these observations, the authors concluded histological changes occur only after the period of ischemia is prolonged to at least 20 minutes. Complete paraplegia occurs only when the period is prolonged to more than 33 minutes. In these cases the maximal histologic changes are seen within 30 minutes and manifest themselves in the form of swelling and chromatolysis. The maximal interstitial reaction is seen within 48 to 72 hours after the production of the lesion.

—*Roland A. Manfredi, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

The Role of the Juvenile Form of Mastopathy in the Cancer Problem (Welche Stellung nimmt die Jugendform der Mastopathie im Krebsproblem ein)? A. MAHNERT. *Wien. med. Wschr.*, 1954, 104: 730.

FIBROCYSTIC mastitis or mastopathy, which is the sequel of hyperfolliculinism, may be considered a precancerous lesion. This fact points to the necessity of including examination of the breasts in each gynecologic study.

Using the wheal method, the author was able to demonstrate hypersensitivity of the mammary glands to estrogenic hormones in very young women with hormonal disturbances. If such disorders are not promptly corrected, cellular changes in the breasts may represent the initial phase of cancer. Such sensitization of breasts may occur as early as during intrauterine life and finds its expression in an engorgement of mammary glands in the newborn.

In 44 juvenile patients with dysmenorrhea or leucorrhea, the author was able to demonstrate bilateral mastopathy with enlargement of the axillary glands in no less than 14 instances. No biopsies were performed. The therapeutic success confirmed the diagnosis.

The most frequent cause of juvenile mastopathy is a lack of corpus luteum hormone. Disorders of the pituitary-midbrain system may also lead to such conditions. By increasing the production of autogenous secretions and by stimulating mesenchymal functions, pregnancy corrects reversible changes. This factor explains the greater frequency of breast cancer in nulliparas.

Mastopathy and carcinoma have disturbed mesenchymal functions in common. Increased permeability of blood vessels precedes the development of a malignant stroma.

Impairment of oxidation, due to insufficient blood supply, chronic inflammatory processes or toxic vasospasm represents the primary phase or genesis of carcinoma.

Mastopathy in puberty or the climacterium is usually of ovarian origin but may occasionally be due to a functional liver damage, while the same condition in middle-aged women is nearly always attributable to hepatogenous factors.

Juvenile mastopathy should be treated with corpus luteum hormone and vitamin B_{12}. Androgens are rarely required. A reducing diet is indicated in obese individuals. —*Joseph K. Narat, M.D.*

The Effect of Adrenalectomy and Oophorectomy in the Treatment of Far Advanced Carcinoma of the Breast. WILLIAM F. ROE and CLARENCE J. BERNE. *West. J. Surg.*, 1954, 62: 457.

COMBINED total adrenalectomy and oophorectomy were performed in 5 patients with advanced carcinoma of the breast previously treated by mastectomy, hormonal medication, and x-ray therapy. In the present report, failures occurred in the 2 patients with duct carcinomas, and remissions of 1 year were obtained in the patients with alveolar or papillary carcinomas of the breast. It has been claimed that regression of metastatic tumors occurred in 50 per cent of the subjects. However, while remissions have occurred in certain organs, rapid growth has been noted to occur in other regions of the same patient.

TABLE I.—INCIDENCE OF METASTASES AND REGRESSION AFTER ADRENALECTOMY.

	5 Cases (Here reported)		*15 Cases (Taylor)*		*25 Cases (Huggins)*		*45 Cases (Composite)*	
Site	*Incid.*	*Reg.*	*Incid.*	*Reg.*	*Incid.*	*Reg.*	*Incid.*	*Reg.*
Bone	5	3	14	4	20	10	39	17
Lungs and pleura	2	2	5	2	7	3	14	7
Skin and subcutaneous..	1	1	13	8	5	2	19	11
Area producing edema of arm..	2	1	0	0	6	1	8	2
Lymph nodes....	1	1	12	7	4	2	17	10
Intracranial.....	1	0	0	0	4	2	5	2
Liver.....	0	0	3	1	1	1	4	2

It is believed that aberrant cortical tissue may account for the failures. Androgen formation due to cortisone replacement therapy might also be responsible for continued growth of the carcinoma. Attention is called to the paradox that the ductal system of the normal breast is stimulated by estrogen, while in duct carcinoma no response is obtained with its withdrawal.

—*B. G. P. Shafiroff, M.D.*

TRACHEA, LUNGS, AND PLEURA

Use of the Endotracheal Tube in Pulmonary Edema. WATTS R. WEBB and GUY D. CAMPBELL. *J. Thorac. Surg.*, 1954, 28: 222.

PULMONARY EDEMA, whether cardiac, anoxic, or toxic, may cause bronchial obstruction due to the accumulation of edematous fluid. The coughing reflex and lymphatic absorption are normally involved in the removal process but become ineffective in acute pulmonary edema. Bronchial obstruction associated with acute pulmonary edema causes anoxia of varying degree, following which a vicious cycle of pulmonary artery hypertension and capillary dilatation leads to further transudation and to the increased accumulation of fluid. This cycle may be broken by mechanical removal of the fluid by means of an aspiration catheter inserted through an endotracheal tube. Oxygen, under positive pressure of 5 to 6 cm. of H_2O, is administered between operations and serves to relieve bronchospasm, to reduce pulmonary capillary blood pressure, and to restore normal intra-alveolar pressure.

In one case of pulmonary edema which developed after operative removal of a lung, 150 aspirations were made and an estimated 750 c.c. of fluid and large quantities of froth were removed. Adjunct measures, such as digitalis and aminophyllin intravenously, mercurial diuretics, and phlebotomy should be included in the therapy of pulmonary edema. Shock superim-

posed on pulmonary edema contraindicates the use of pressurized oxygen.

—B. G. P. Shafiroff, M.D.

Surgical Resection in Pulmonary Tuberculosis (La chirurgia di resezione nella tubercolosi polmonare). MICHELE A. CHIECHI. *Chir. torac.*, 1954, 7: 185.

THE AUTHOR reports on 72 patients operated on at the Municipal Sanitorium of Chicago. Pulmonary resections varied from pneumonectomy to segmental resections. They were followed up from 1½ to 4 years. This does not allow for definite conclusions, but certain principles can be outlined.

Surgical intervention in pulmonary tuberculosis is considered to be another good form of treatment and in certain cases is considered to be superior to other forms already used. The indications in general are instances in which other forms of treatment have failed or are contraindicated. The patients should have no active bronchial lesions observable by bronchoscopic examination. Chemotherapy should be used for long periods and the sputum should be negative.

—Lucian J. Fronduti, M.D.

The Role of Segmental Resection for Bronchiectasis in Conserving Pulmonary Function. RICHARD H. OVERHOLT, JAMES H. WALKER, and BENJAMIN E. ETSTEN. *Dis. Chest.*, 1954, 26: 123.

THE VALUE of segmental resection of the lung in conserving good functional tissue has increased the number of cases in which complete extirpation of the disease can be accomplished. The authors present 2 case histories which demonstrate the adequacy of pulmonary function following segmental resection for bronchiectasis.

The first patient, a 46 year old woman, had five moderately severe pulmonary hemorrhages within a year. Bronchography revealed bronchiectasis of the superior segment of the left lower lobe and the lingula of the left upper lobe. Segmental resection of the 3 involved segments was carried out, leaving the five normal segments intact. Postoperative studies demonstrate that the remaining five segments contribute 30 per cent of the total oxygen consumption and 42 per cent of the total ventilation.

The second patient was a 29 year old man in whom, at the age of 3, a lung abscess developed which was treated by open drainage. At the age of 20, a second abscess developed, following pneumonia. Bronchograms revealed bronchiectasis of the entire left lung, with exception of the posterior-apical segment of the left upper lobe. At the time of surgical intervention, all of the diseased lung, with exception of only the one segment in the left hemithorax, was removed. Temporary crushing of the left phrenic nerve was carried out at this time. Follow-up studies reveal that the remaining segment contributes 22.6 per cent of total oxygen consumption and 28 per cent of total ventilation.

The results of these investigations indicate that the hyperinflation of lung tissue following segmental resection does not impair intrapulmonary mixing of gases. Pulmonary function of the remaining lung tissue is of physiologic value.

—John H. Davis, M.D.

The Surgical Treatment of Pulmonary Blastomycosis. M. LAWRENCE WHITE, JR., and EARL T. OWEN. *Am. Surgeon*, 1954, 20: 981.

THE AUTHORS report their experience in the treatment of 4 patients with pulmonary blastomycosis. They believe that their experience is unusual in that they could find only 13 published cases in which resection was done for this disease.

In none of these cases was the diagnosis of blastomycosis suspected preoperatively. The mortality in this series of 4 patients was 50 per cent, and the authors feel that an accurate diagnosis would have prevented such a high mortality, as, very likely, surgery would not have been performed at all. This illness is best diagnosed by bronchoscopic biopsy or examination of the secretions for blastomyces and, when diagnosed, it is probably best treated medically. The best available medical weapon today apparently is stilbamidine or 2-hydroxystilbamidine. These drugs have a toxicity particularly for the fifth nerve and at times to other nerves.

All of the authors' cases came to surgery because of an unresolved pulmonary lesion which remained even after intensive chemotherapy, and carcinoma was suspected. The authors have reported these cases with admitted lack of pride in their results, but with the hope of publicizing their unfortunate experience with surgery. They believe that surgery might find its place in the resection of residual lesions in a quiescent stage of the illness following adequate medical therapy.

—Edmund R. Donoghue, M.D.

Malignant Bronchostenosis in the Bronchoscopic and Bronchographic Picture (Die maligne Bronchostenose im bronchoskopischen und bronchographischen Bild). R. HOFFMANN, H. LAUX, and C. STENGEL. *Chirurg*, 1954, 25: 392.

THE AUTHORS emphasize that both bronchoscopic and bronchographic studies are necessary to give a complete picture of a malignant bronchostenosis. The literature on bronchoscopy has been relatively meager especially in Germany because the findings do not lend themselves to a pictorial presentation. The author urges a detailed classification of the endoscopic picture seen in malignant bronchostenosis and correlation with the bronchographic findings.

He then proceeds to discuss various types of lung tumors, giving the information which may be obtained by bronchoscopy together with the pathoanatomical and pathophysiological explanations of the optical phenomena. The limitation of bronchoscopy and the additional information obtainable by bronchography are then given for each type.

This article is not concerned with the clinical aspects of lung tumors but rather with the observable optical changes brought about by the tumors. Bronchoscopy may show edema, inflammation, pus, loss of elasticity of the rings, the tumor itself (which with, and sometimes without, biopsy may permit a histological diagnosis), fixation of bronchi, accumulation of secretions, the differentiation of true stenosis from pseudostenosis (this may be due to spasm or mucous proximal to a tumor and may lead to an erroneous concept of inoperability—a subject the authors have emphasized).

Bronchography demonstrates the changes beyond the stenosis (atelectasis, emphysema, abscess) and tumors in the periphery beyond the reach of the bronchoscope.

Five reproductions of roentgenograms help greatly in illustrating the authors' material. Since the article is one of detailed comparisons it does not lend itself very well to abstracting. To those interested in chest surgery the original article is recommended.

—*Robert C. Combs, M.D.*

Bronchogenic Carcinoma; a Study of 517 Cases. ADRIAN EHLER, ALLAN STRANAHAN, and KENNETH B. OLSON. *N. England J. M.*, 1954, 251: 207.

AN ANALYSIS of 517 cases of bronchogenic carcinoma admitted to the Albany Hospital, Albany, New York, in the last 17 years is presented. The two leading cell types were: squamous cell, 33.2 per cent, and anaplastic (includes large cell and oat cell types), 28.4 per cent. No pathologic diagnosis was made in 103 cases (19.9 per cent). An increased incidence of over 700 per cent was noted between the initial 5 years and the last 5 years of the study. Ninety-three per cent of the carcinomas in this series occurred in males and 73 per cent of all patients were in the fifth and sixth decades of life.

The incidence of bronchial symptoms was highest (66.7%) in patients with squamous cell carcinoma. Patients with other types of tumors more frequently had complaints of other symptoms, thus indicating metastatic disease at the time the original diagnosis was made.

A breakdown of the location reveals that over half of these tumors occur in the upper two lobes. In those patients in whom a measurable tumor mass could be seen in the x-ray film (32.5%), there was no correlation with the cell type.

Thirty per cent of the lesions were considered operable at the time of diagnosis. In the 146 patients who had been subjected to a thoracotomy, 52.2 per cent of the squamous cell carcinomas and 50 per cent of the adenocarcinomas were resectable. The operative mortality averaged 8 per cent in the last 10 years of the study, and in those patients in whom some type of resection was accomplished an operative mortality of 18 per cent was noted.

Seventy-nine patients (15.4%) in the entire group survived for 1 year or more after the diagnosis was made. Ten per cent of the patients survived 1 year or more without resection, and 52.5 per cent survived 1 year or more following resection. Five patients were alive at the end of 5 years and 4 of these had had some type of pulmonary resection. The only 5 year survivals were among patients with squamous cell lesions (3) and adenocarcinomas (2).

A probability curve (survival) is presented which compares white males who had had with those who had not had surgical intervention.

Routine chest films revealed only 1.6 per cent of the total group to have carcinoma. Twenty-five patients (4.9%) had normal P.A. chest films at the time of diagnosis.

No patient with known lymph node involvement at the time of surgery survived for 5 years.

—*John H. Davis, M.D.*

The Inoperable Lung Carcinoma (Das inoperable Lungencarcinom). HEINZ BARTHEL. *Thoraxchirurgie*, 1954, 2: 101.

THE AUTHOR, of the Surgical Department of the University of Hamburg, in Germany, discusses the criteria of operability in lung carcinoma. In a series of 300 patients observed at this hospital, 175 were deemed inoperable. In 101 of these the condition was recognized as inoperable by clinical methods alone, and in 74 an exploratory thoracotomy was necessary to reveal the inoperability.

A lung tumor may be inoperable due to one of the following three reasons: (1) if metastases in other organs or carcinosis of the pleura are present; (2) if the condition of the cardiovascular system or the respiratory function is such that the patient is not expected to survive the intervention; (3) if the tumor has invaded the large vessels of the hilus, the vena cava, the aorta, or the pericardium so that radical extirpation is mechanically impossible.

In the author's material, metastases to the brain, bones, and lymph nodes were found in 34 of the 175 inoperable cases; carcinoma of the pleura was found in 31 patients. In 65 cases, operation was contraindicated for clinical reasons.

Organic heart defects with or without decompensation and severe arrhythmias are absolute contraindications. Myocardial damage, shown in the electrocardiogram, and poor veritol test are only relative contraindications. In some of the author's cases, medication, physiotherapy, and a special diet for 2 to 3 weeks improved the condition so much that intervention became possible.

Of special interest is the determination of the respiratory function. As a considerable portion of functioning lung tissue is removed in the resection, certain minimal requirements must be met to make the operation possible. These are: a vital capacity above 1,200 c.c., apnea time above 20 seconds, and partial oxygen pressure above 60 mm. Hg. Determination of the partial oxygen pressure is the most important of these tests; the author saw a number of patients in whom the vital capacity and apnea time were satisfactory but who had to be barred from operation because the oxygen pressure was below 60 mm. Hg.

Other contraindications include nephrosclerosis, marked hypoproteinemia, and cachexia.

—*Werner M. Solmitz, M.D.*

The Inoperable Lung Carcinoma; Roentgenological Aspect (Das inoperable Lungencarcinom; Roentgenologischer Teil). MARTIN MEIER-SIEM. *Thoraxchirurgie*, 1954, 2: 111.

THE PRESENT article is based on 175 cases of inoperable carcinoma of the lung observed at the University of Hamburg, in Germany (the same material as that reported upon elsewhere in this volume by Heinz Barthel). Whereas Barthel discusses the important clinical considerations in deciding upon the operability of lung carcinoma, Meier-Siem, in the present article, describes the roentgenologic findings which indicate inoperability.

The author differentiates between absolute signs of inoperability and relative signs which contraindicate resection only in conjunction with other clinical data.

The roentgenologic findings which indicate inoperability are as follows: (1) extension of the tumor to the contralateral side; (2) macroscopically demonstrable changes closer than 2 cm. to the bifurcation; (3) marked involvement of the lymph nodes of the bifurcation, shown in the roentgenogram as a rounding or bending of the bifurcation or as an indentation of the main bronchi from the medial direction; (4) changes in the walls of the trachea indicating invasion by carcinomatous tissue; (5) the same applies to changes at the large venous vessels, especially the vena cava; (6) if the lung hilus is "frozen," i.e., if it remains rigid on respiratory movements, this is proof that the mediastinum has been invaded; (7) changes in the site or shape of the esophagus; (8) marked lymph node involvement in the superior mediastinum, in the area of the aorta; (9) paresis of the recurrent nerve is an absolute contraindication.

Invasion of the pericardium or of the heart can not be demonstrated roentgenologically.

Tomography and bronchography provide the most useful information as to the shape and site of the tumor, and involvement of the lymph nodes. Although the bronchogram gives clearer and more impressive pictures, tomography has the advantage of being less difficult for the patient and often makes bronchography unnecessary.

Roentgen films of the esophagus should never be omitted. In some cases in which the roentgenogram does not show involvement of the mediastinum, changes in the site or shape of the esophagus may reveal mediastinal involvement.

In spite of all modern roentgenologic methods, the demonstration of mediastinal infiltration is still quite difficult. Among 74 patients in whom exploratory thoracotomy was done, the mediastinum was invaded in 44 patients who had not shown any mediastinal involvement on x-ray examinations. To improve on the accuracy of the roentgenological examination, the author tried the use of pneumomediastinum with presacral or suprapubic insufflation of oxygen. The results were not very encouraging as only small amounts of oxygen rise from the retroperitoneal space into the mediastinum. —*Werner M. Solmitz, M.D.*

The Question of Fibrosarcoma of the Lung (Zur Frage der Fibrosarcome der Lunge). W. LORBEK. *Thoraxchirurgie*, 1954, 2: 142.

THE AUTHOR, of the Second Surgical Hospital of the University of Vienna, Austria, discusses the question of whether true lung sarcomas occur at all. Whereas the ratio between lung sarcoma and lung carcinoma was assumed to be 1 to 7 in 1886, statistics published in 1953 arrived at a ratio of 1 to 250. The reason for this marked change appears to be twofold: In the first place, early investigators often described carcinomas with very small or polymorphous cells ("oat cell carcinoma") as sarcomas; secondly, there is no doubt that the absolute incidence of lung carcinoma has markedly increased during the last decade or so.

A critical study of the literature together with his personal observations convinced the author that true lung sarcoma originating from the alveoli does not occur at all. All so-called lung sarcomas are really sarcomas of the bronchi. These occur in two very different forms: endobronchial sarcoma, also called fibrosarcoma of the bronchus; and sarcomas with infiltrating proliferation into the lung tissue, so-called lung sarcoma.

Two cases are described in detail.

—*Werner M. Solmitz, M.D.*

HEART AND PERICARDIUM

Nontraumatic Pneumopericardium and Pyopneumopericardium; Report of 2 Cases. PAUL M. DASSEL and ISRAEL E. KIRSH. *Radiology*, 1954, 63: 346.

AFTER a chronologic review of the literature, dating back to 1894, the authors describe the clinical features and roentgenologic findings of nontraumatic pneumopericardium, and report 2 cases in detail.

The clinical features are: sudden onset of precordial or upper abdominal pain, dyspnea, cyanosis, and fainting. The mixture of air and fluid in the pericardial sac produces high-pitched metallic splashing sounds with every heart beat, so that the diagnosis is usually made on the basis of the physical examination alone. The pulse rate is increased and the temperature is elevated. The electrocardiographic changes are those of pericarditis.

The roentgenologic findings are characterized by visualization of the parietal pericardium, which is separated from the heart by air, and by the demonstration of a pneumopericardium or pyopneumopericardium which to all appearances has occurred without trauma. The thickness of the parietal pericardium depends on the associated inflammation and edema, and the air in the pericardial cavity usually extends more to the left than to the right. In the presence of fluid, there is a straight line which remains horizontal in any body position. On fluoroscopic examination the heart pulsates vigorously, and if fluid is present its surface seems to quiver, due to the waves produced by the pulsation. By placing the ear against the chest wall, a loud splashing sound is heard, synchronous with the pulsation.

In the authors' first case, a pyopneumopericardium developed as a late complication of peptic ulcer. The patient, a 47-year-old white male, had undergone three operations (including subtotal gastric resection and vagotomy) for a peptic ulcer which did not respond to therapy. He was readmitted to Hines Hospital twice subsequently because of recurrent gastric hemorrhages. During his last hospitalization a routine roentgenogram of the chest revealed the presence of a pneumopericardium. Further studies, by administering barium sulfate and later lipiodol orally, showed that there was a fistula connecting the pericardial cavity with a subphrenic abscess, which resulted from perforation of the peptic ulcer. The patient died approximately 5 weeks later and these findings were confirmed at autopsy.

In the second case, that of a 54-year-old white male, the pneumopericardium followed perforation of a carcinoma of the esophagus. In this case a portable roentgenogram of the chest showed evidence of pneumopericardium and bilateral bronchopneumonia. The patient died the same day; postmortem examination was not performed.

—*T. Leucutia, M.D.*

Indications for Surgical Treatment of Mitral Stenosis, from a Clinical Point of View (Indicaciones del tratamiento quirurgico de la estenosis mitral desde el punto de vista clinico). GASTON DUSSAILLANT G. *Rev. med. Chile*, 1954, 82: 73.

MITRAL STENOSIS may sometimes be compatible with a long life term, although this is an exception. The patients are usually subjected to prolonged invalidism which may be greatly relieved by surgery.

Surgery aims at substituting for a major stenosis a minor one more compatible with an active life, while nonsurgical treatment may be carried on at the expense of severe limitation of the patient's activity. The suffering of a patient with mitral stenosis is usually so great that he rarely will refuse running the risk of an operation.

There are patients with slight or practically no symptoms which are diagnosed only by roentgenological examination or by electrocardiography. Such patients should not be submitted to surgery. Normally the area of the mitral orifice varies from 4 to 6 cm. It it is under 1.5 cm. the patient is considered to have a major case of mitral stenosis.

Diagnosis of major mitral stenosis. The diagnosis of major cases of mitral stenosis is usually easy, but occasionally it may be difficult and require the finding of secondary signs such as a small-sized left ventricle and enlargement of the left auricle by roentgenography or of mitral stenosis by electrocardiography.

Great importance is given to examination of the patient in the left lateral position, to palpation of the apex beat, and to a snapping first sound. Cardiac catheterization was done in 10 patients but is not greatly favored by the author.

Experience has shown that a case of true mitral stenosis or mitral stenosis associated with slight mitral incompetence, showing dyspnea, hemoptysis, arterial embolism, and auricular flutter with left auricular enlargement, pulmonary artery dilatation, or any enlargement of the right ventricle is considered as a case of major mitral stenosis. Patients with such conditions should be operated upon, the sooner the better. Those with extreme cases of right cardiac insufficiency, frankly irreversible, should not be operated upon as the results will be poor.

Diagnosis of mitral stenosis with associated mitral incompetence. The association of mitral incompetence decreases the surgical possibilities greatly; the problem sis to determine the exact grade of mitralincompetence and if surgical treatment is indicated. Up to now such a diagnosis is mainly clinical, roentgenologic, and electrocardiographic. Systolic murmur propagating toward the axilla, with a decrease of the first sound and especially when associated with a left ventricular enlargement is of great significance for the diagnosis. No one method alone is sufficient for a correct diagnosis.

Fortunately, true cases of mitral stenosis are more common than those associated with mitral incompetence. They represented 74 per cent of the author's 43 cases on which he operated.

Surgery is not justified in cases of mitral stenosis with absence of, or only slight symptoms of cardiovascular damage (grade 1). It is also contraindicated in advanced cases with irreversible right heart insufficiency (grade 2). It may be performed in cases with partially reversible right heart insufficiency, although its main indication is in intermediate cases, grades 2 and 3.

Surgical contraindications. Bacteriologic endocarditis and serious diseases of other viscera, such as cancer and advanced nephritis, are contraindications to surgery of mitral stenosis. In case of bacterial endocarditis surgery may be performed 3 to 4 months after its subsidence. Active rheumatic states are also contraindications especially in patients under 30 years of age. Slight active rheumatic states are only relative contraindications.

The author treats these cases with penicillin and sulfadiazine, according to the recommendations of the American Heart Association.

Associated mitral incompetence as well as aortic stenosis or incompetence of medium or major grade are also contraindications especially when enlargement of the left ventricle is shown. As mitral stenosis usually decreases the size of the left ventricle, any enlargement of it due to the former lesions certainly should be considered seriously.

Additional factors indicating or contraindicating surgery for mitral stenosis. Hemoptysis is a formal indication for surgery. Surgery should also be performed in cases with associated arterial embolism, after the acute phase has passed, and should be preceded and followed by proper anticoagulating treatment. Repeated crises of paroxysmal tachycardia and of transitory auricular flutter are additional indications for surgical treatment. The optimal age for surgical treatment for mitral stenosis is between 30 and 40 years.

Pulmonary semilunar valve incompetence is no contraindication for surgery but its association with mitral stenosis advances the possibility of less favorable results. Left ventricular enlargement contraindicates surgery. Great enlargement of the left auricle is also a contraindication as it probably represents an associated advanced mitral incompetence, although this is not always the case. —*Joao B. Vianna, M.D.*

The Effect of Intrapericardial and Intracardiac Procaine upon the Circulation in Man During Mitral Commissurotomy and Pulmonary Valvulotomy. HUGH F. FITZPATRICK, E. M. PAPPER, ENZO KRAHL, F. F. MCALLISTER, and GEORGE H. HUMPHREYS. *J. Thorac. Surg.*, 1954, 28: 259.

ANESTHETIC PROCEDURES and surgical manipulation of the heart and great vessels have been associated with alterations in cardiac rate and rhythm and have produced ventricular tachycardia, ventricular fibrillation, and depression in the perfusion pressure of vital organs. Procaine, topically or intravenously, has been recommended for the control of this type of arrhythmia.

The injection of procaine into the pericardial sac or at the base of the auricular appendage in 11 patients undergoing mitral commissurotomy was followed by ventricular tachycardia in 8 patients, a fall in blood pressure in 4 patients, cardiac arrest in 1 patient, and ventricular fibrillation in another. At the time of fracture of the commissure bursts of ventricular extrasystoles occurred in all cases.

Twelve other patients also subjected to mitral commissurotomy were not injected with procaine and in this group significant cardiac arrhythmias of any

type did not occur. It was concluded that procaine failed to serve as a prophylaxis for cardiac arrhythmia but was causally related to the development of tachycardia and hypotension, both of which could be of great harm in patients already suffering from limited cardiac reserve. —*B. G. P. Shafiroff, M.D.*

ESOPHAGUS AND MEDIASTINUM

Therapy of Perforations in the Thoracic Portion of the Esophagus (Zur Therapie der Perforation im Brustabschnitt der Speiseroehre). H. KARCHER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 290.

THE AUTHOR, of the Surgical Department of the University of Heidelberg, Germany, discusses the management of perforation of the esophagus and reports 9 cases from his own observation.

Whereas before the era of chemotherapy and antibiotics the majority of patients with perforation of the esophagus died of septic inflammation of the esophagus, the mediastinum, the lung, or the pleura, at the present time conservative treatment is the method of choice and is preferable to primary suture. All 9 of the author's patients survived under conservative management with large doses of sulfonamides and antibiotics.

The author cites a number of reasons why surgery of the perforation should not be attempted:

Prevention of infection of the mediastinum by suture of the perforation can be expected only if it is done within 6 hours. This time limit, however, practically always has elapsed before a competent surgeon sees the patient, and by the time the patient is operated upon infection has already set in, and the surgeon is compelled to work in freshly inflamed tissue. Furthermore, the intervention is a great one and it involves considerable postoperative risk. It is difficult to visualize the perforation in the swollen and edematous esophagus wall, and suturing in the inflamed tissue is unsafe; not infrequently stenoses of the esophagus result from the suture. In the transthoracic approach, infection of the pleura is unavoidable. The overall time of hospitalization is shorter with conservative treatment.

In 4 of the 9 cases the perforation was caused by therapeutic dilatation of cardiospasm or esophageal stenosis; in 2 cases by attempts to push an ingested foreign body (coin, marble) into the stomach with a stomach tube; in 2 cases a swallowed foreign body (chicken bone, toy) had caused a tear in the esophagus; and in 1 case the perforation occurred in a traffic accident.

All 9 patients recovered, although in 3 of them the course was complicated by empyema which made rib resection and drainage necessary.

—*Werner M. Solmitz*, M.D.

MISCELLANEOUS

Congenital Diaphragmatic Hernia. WILLIAM L. RIKER. *Arch. Surg.*, 1954, 69: 291.

Thirty-three cases of various types of congenital diaphragmatic hernias are discussed, highlighting some of the problems related to each type of hernia. In patients under a year of age, especially under 1 week of age, symptoms are usually severe, there is usually no confining hernial sac, and emergency operative repair is necessary. If the hernia is discovered after 1 year of life, the symptoms are usually mild or absent, there is a confining sac of some type, and surgical repair may be considered at leisure.

—*John J. Maloney, M.D.*

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Gastric Secretion in Dogs During Pregnancy and Lactation. JACK D. MCCARTHY, SHIRL O. EVANS, and LESTER R. DRAGSTEDT. *Gastroenterology*, 1954, 27: 275.

QUANTITATIVE collections of gastric secretion were made for long periods of time from female dogs provided with accessory stomach pouches. Pregnancy had no consistent effect in either stimulating or inhibiting gastric secretion, but a profound and continued hypersecretion of gastric juice occurred during lactation.

—Ely Elliott Lazarus, M.D.

Surgical Treatment of Parenchymatous Gastric Hemorrhages (Zur chirurgischen Behandlung parenchymatoeser Magenblutungen). GEORG WERNER GROSS and ALBERT G. WEYER. *Chirurg*, 1954, 25: 337.

THE TENDENCY to perform an early operation for a bleeding gastric ulcer is growing. Fluoroscopic studies, which can be done even before cessation of hemorrhage, allow exclusion of varicose esophageal veins as a source of bleeding.

Increased permeability of capillaries may be due to the effect of gastrin, allergy, blood diseases, vitamin K deficiency, or cerebral impulses following brain injury.

Signs of erosive gastritis may usually be found in patients with parenchymatous gastric hemorrhages.

Even if an ulcer cannot be demonstrated, the authors perform a two-thirds gastric resection in patients with severe hemorrhages. In 6 patients they were able to postpone the operation for from 2 to 3 weeks and utilize the time to give repeated blood transfusions. All patients recovered. During the preoperative period the bleeding did not stop completely and therefore the operation was justified. Follow-up studies extending up to 4½ years showed that no recurrence of hemorrhages followed the operation.

—Joseph K. Narat, M.D.

Transabdominal Total Gastrectomy Followed by Supradiaphragmatic Esophagojejunal Anastomosis; a New Method (La gastrectomie totale transabdominale suivie d'une anastomose oesophago-jéjunale supradiaphragmatique; une méthode nouvelle). I. BOEREMA. *J. chir.*, Par., 1954, 70: 453.

ONE OF THE DIFFICULT ASPECTS of total gastrectomy is jejunoesophageal anastomosis. Attempts to solve this by anastomosing the abdominal esophagus increase the risk in that malignant tissue may remain in the esophageal stump; on the other hand, anastomosis of the thoracic esophagus increases the mortality by increasing the seriousness of the operation with the additional thoractomy, and, moreover, the sutures do not hold well in this area of the esophagus and tend to cut through.

In this new procedure block dissection of the stomach is performed and the esophagus is gently pulled into the abdomen for about 1 hand's width and maintained in this position with 2 tapes. End-to-end anastomosis is then carried out with the aid of a button analogous to the Murphy button but with which the disadvantages of the latter, in particular contusion of the esophagus, are obviated. (This button is described and illustrated in detail.) The author has not found a y-anastomosis satisfactory and he prefers isolating a loop of terminal jejunum or ileum; the mesentery of such a loop is long enough so that no vessels need be cut, and its distal end can be easily anastomosed to the duodenum.

Oral liquid feedings can usually be started after a few days. Strings attached to the button are left with their proximal end coming out of the nose. These strings are brought out through the mouth on the twelfth postoperative day and the button is removed by simple traction.

—Jonas Brachfeld, M.D.

Experimental Comparison of Protein and Fat Assimilation After Billroth II, Billroth I, and Segmental Types of Subtotal Gastrectomy. TILDEN C. EVERSON, EVERETT HOPPE, and ANNA POULOS. *Surgery*, 1954, 36: 525.

THE NUTRITIONAL STATUS was studied in experimental dogs following the Billroth II, Billroth I, and segmental types of subtotal gastrectomy. The excretion of ingested nitrogen was greatest in the dogs subjected to the Billroth II type of gastrectomy, the next greatest in those subjected to Billroth I gastrectomy, and the least in those subjected to segmental gastrectomy. The excretion was 24 per cent of the ingested nitrogen after Billroth II gastrectomy, 19.3 per cent after the Billroth I gastrectomy, and 12.6 per cent after segmental gastrectomy. Normal dogs excreted 14.9 per cent.

Similarly there was a greater excretion of fat in the feces following the Billroth II gastrectomy, a lesser amount excreted after the Billroth I gastrectomy, and the least amount excreted after segmental gastrectomy, the values being 27, 10.6, and 6.4 per cent respectively. Normal dogs excreted 4.9 per cent.

The majority of the animals subjected to the Billroth II type of gastrectomy lost weight on ad libitum diets, while the majority of animals subjected to the Billroth I or segmental gastrectomy gained weight or maintained their weight on similar diets.

The nutritional status of animals subjected to Billroth II gastrectomy was markedly inferior to that of animals subjected to Billroth I gastrectomy or segmental type gastrectomy.

The nutritional status after the segmental type of gastrectomy was essentially normal; the nutritional status after Billroth I gastrectomy was inferior to that following the segmental type of subtotal gastrectomy, although the difference was not great in any case.

—Edmund R. Donoghue, M.D.

Staphylococcus Pseudomembranous Enterocolitis, a Complication of Antibiotic Therapy. GEORGE S. SPEARE. *Am. J. Surg.*, 1954, 88: 523.

IN THE PAST 5 YEARS an increasing incidence of Staphylococcus pseudomembranous enterocolitis has been found at autopsy and as a postoperative compli-

cation. It has been suggested that this increased incidence runs parallel with the increased universal usage of antibiotics. Bacteriologic studies show antibiotic resistant strains of Staphylococcus aureus in many of these patients.

The staphylococcus is present in the nose, throat, skin, and feces of many people, both patients and hospital personnel. It is usually found in small numbers and causes no trouble. However, in rare cases in which the normal bacterial flora of the gastrointestinal tract are destroyed or depressed by antibiotic therapy, this staphylococcus grows rapidly in large numbers and produces the overwhelming infection found in pseudomembranous enterocolitis.

Clinically the patient seems to be making a good recovery from 24 to 48 hours after the operation. At this time some abdominal pain and nausea may develop. Diarrhea will then start and become profuse, the patient passing enormous quantities of rice-water stools. In the next 24 to 48 hours the condition of the patient deteriorates very rapidly and becomes critical. The temperature reaches 105 to 107 degrees F. The pulse goes up to 120–160. Respirations are only slightly elevated, unless there are associated pulmonary complications.

The patient goes into a state of shock with cyanosis, coldness, and mottled appearance of the skin. The blood pressure frequently drops to zero and the pulse is unobtainable. The patient becomes lethargic, stuporous, semicomatose, or altogether unconscious. Urinary output is diminished or totally suppressed. There is marked dehydration, the patient losing enormous amounts of fluid into the bowel and through the rectum. The electrolytes fall. Replacement of fluids and other supportive measures may bring about some improvement, but usually in a few hours or in a day or two the patient succumbs.

The diarrhea may diminish or stop before the end because of the increasing paralytic ileus; however, enormous quantities of fluid continue to pass into the lumen of the dilated bowel. The abdomen is usually moderately distended with some general tenderness.

Inasmuch as most of these patients have had abdominal operations—and many of them bowel resections or anastomoses—the differential diagnosis is difficult. Many times an abdominal exploration is carried out on a critically ill patient because complications such as peritonitis, intestinal obstruction, and leaking anastomosis cannot be ruled out.

Pathologically there is intense hyperemia of the submucosa and vascular engorgement with edema of the stroma. There is exudation of erythrocytes, leukocytes, lymphocytes, and plasma cells. The mucous membrane is undermined, becomes necrotic,and peels off, thus forming the diphtheritic membrane. Perforation is rare. While the lesion may involve the entire gastrointestinal tract, the segment of bowel most commonly involved is the ileum and upper colon.

Treatment should consist of the use of erythromycin until sensitivity tests are made and the appropriate antibiotic is administered. Fluid and electrolyte losses should be promptly and adequately replaced, and shock should be treated with blood, blood substitutes, oxygen, vasopressor drugs, cardiorespiratory stimulants, and other supportive measures.

The disease runs a fulminating course, usually with a fatal outcome in 3 to 11 days. Among 22 cases collected from the recent literature, only 3 patients survived. —*Ely Elliott Lazarus, M.D.*

Small Bowel Lesions with Symptoms of Bleeding Duodenal Ulcer (Sulle lesioni anatomiche dell'intestino tenue mesenteriale a sintomatologia da "ulcus duodeni" sanguinante). M. DeFranchis and P. Nanni-Costa. *Arch. ital. mal. app. diger.*, 1954, 20: 214.

The authors report upon a male patient who had had recurring episodes of bleeding for 12 years. He was believed to have a duodenal ulcer, although it could never be demonstrated roentgenologically.

At operation he was found to have a polypoid mass in the first loop of the jejunum, 2 cm. from the angle of Treitz. About 10 cm. of bowel was resected and an end-to-end anastomosis was accomplished. The lesion was reported to be a carcinoma. The postoperative course was uneventful and after follow-up observation for a period of 20 months, the patient was without symptoms.

The literature is reviewed and 12 other similar lesions have been reported. Three of these were of nerve tissue origin, 3 were vascular, 2 were carcinomatous, 2 were a Meckels' diverticulum, and 1 was a carcinoid.

The causes of the duodenal ulcer symptoms are discussed and various theories are advanced. The two principal ones are: (1) an associated inflammation of the first portion of the duodenum which cannot be revealed roentgenographically or by palpation at the time of operation; (2) a reflex stimulation caused by the lesion in the first loop of the small bowel. The authors feel that the duodenal symptoms are due to an associated duodenitis and to reflexes arising in ulcerations or erosions of the intestine and stimulated by the passing food or digestive juices.

—*Lucian J. Fronduti, M.D.*

Regional Ileitis (Contributo allo studio della enterite segmentaria; l'ileo-tiflite regionale). E. de Cesare and G. Ricci. *Arch. ital. chir.*, 1954, 78: 71.

The author reports on 2 cases of regional ileitis. One patient was a woman of 36 years and the other was a man of 40 years. In the first case an inflammatory mass involving the terminal ileum for a distance of 15 cm. and the lower part of the cecum was found at operation. In the other patient a very much similar lesion was found. In both cases a right hemicolectomy with a laterolateral transverse ileocolostomy was performed. An appendectomy had been performed in the first patient 11 years before but the symptoms had continued. The results were good in both cases (a 3 year follow up in the first case). The second case was operated on only recently.

A review of the literature on the subject is presented. —*Lucian J. Fronduti, M.D.*

Difficulties in Diagnosis of Some Lesions of Colon. Frederick A. Coller and William J. Regan. *Arch. Surg.*, 1954, 69: 516.

The authors present a collection of problem cases with lesions of the colon. Patients with contrasting lesions included the following: inflammatory lesions of

the ileocecal area (Crohn's disease and tuberculosis) mimicking carcinoma of the cecum; amebic ulcer of the transverse colon simulating a carcinoma; endometriosis and carcinoma of the sigmoid; colloid carcinoma of the rectosigmoid resembling nonspecific colitis; postirradiation narrowing of the rectum and adenocarcinoma; congenital multiple polyposis and pseudopolyposis in chronic ulcerative colitis.

Although most cases of lesions of the colon can be definitely diagnosed by clinical, laboratory, and x-ray findings, occasionally the true diagnosis is made only by microscopic examination of the diseased tissue.

—S. Lloyd Teitelman, M.D.

Congenital Megacolon; "Hirschsprung's Disease." GEORGE P. KEEFER and JOHN F. MOKROHISKY. *Radiology*, 1954, 63: 157.

CONGENITAL megacolon, or Hirschsprung's disease, is relatively uncommon. Reports on the incidence vary from 1 to 1,000 to 1 to 20,000 live births. The apparent increase in incidence noted in the past few years undoubtedly is directly related to improved diagnostic methods both on the part of the clinician and the radiologist. A familial association has been noted by several authors.

The terms of organic megacolon, idiopathic megacolon, and Hirschsprung's disease have been used synonymously in the past. However, for reasons which are of more than mere academic import, these lesions should be differentiated. The term Hirschsprung's disease should be reserved for those cases in which there is a functional obstruction of the bowel as a result of a narrowed segment, which in turn is due to the absence or diminution of ganglion cells in the myenteric plexus.

Organic megacolon may occur at any age. The obstructing lesion may be a tumor, stricture, congenital band, or another pathologic process which can be demonstrated grossly. Idiopathic or functional megacolon has no definite etiologic basis. Contributing factors are: faulty bowel habits, a spastic anal sphincter, or an unusually elongated sigmoid colon. Constipation is not present from birth. The onset of symptoms is slow. The diagnosis is made by means of an examination of the large bowel with a barium enema which shows dilatation of the colon all the way to the anus.

In congenital megacolon, the symptoms begin at birth or during the first few weeks of life. Constipation, progressive abdominal distention, and vomiting characterize this disorder. Some of the younger patients present signs of acute intestinal obstruction which, unless relieved by surgical intervention, may cause rapid deterioration and death. At operation, one finds an area of spasm or narrowing, usually in the sigmoid area, which has produced a functional type of obstruction. The area of spastic or narrowed bowel in Hirschsprung's disease may be short or long, although in the great majority of cases (90 per cent) it is short. The typical and most common form of narrowing is found in the region of the rectosigmoid colon. The narrowed segment usually represents only a part of the aganglionic area.

Although the relationship between the scarcity or absence of ganglion cells in the myenteric plexus and the abnormal progression of peristalsis seen in this disorder was known as early as 1901, it was not until recently that the pathologic physiology of congenital megacolon was completely understood. Swenson and his group and others have shown by bowel motility studies that the aganglionic segment does not exhibit co-ordinated peristaltic activity and for this reason acts as a chronic obstruction to the passage of the feces. Other authors have emphasized the loss of the normal defecation reflex in these patients.

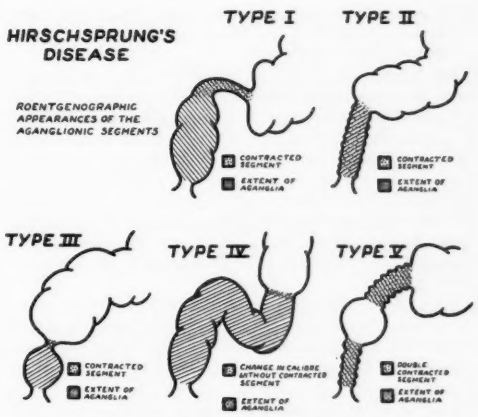


FIG. 1 (Keefer, Mokrohisky). Diagrammatic illustration of fluoroscopic and roentgenographic variations in congenital megacolon (Hirschsprung's disease).

The roentgenographic diagnosis of Hirschsprung's disease is made by demonstrating a narrowed segment of colon, usually in the rectosigmoid area, proximal to which is an area of marked dilatation. Special techniques including air contrast are used to define the zone of change from ganglionic to aganglionic bowel. The authors have defined 5 variations of this disease from the fluoroscopic and roentgenographic viewpoint (Fig. 1). In general, ganglion cells are absent throughout the entire segment down to the anus, irrespective of the type of narrowing present. In the majority of cases the transition between the narrowed and dilated segments is abrupt. If the entire colon is aganglionic, megacolon is usually absent. Instead, the entire colon is somewhat smaller in caliber than normal, or it is markedly contracted.

The length of the aganglionic segment does not necessarily determine the prognosis in congenital megacolon. Most of the neonatal deaths due to this disease, however, are of the long segment (the more rare) variety. If the patient survives the first few years of life and the constipation is adequately controlled by conservative treatment, the prognosis improves. A few cases of aganglionic megacolon have been reported in the older age group.

The accepted method of treatment of Hirschsprung's disease at the present time consists of removing the obstructing aganglionic segment of bowel. Swenson's pull-through procedure allows re-establishment of the continuity of the colon and preservation of the anal sphincter. *—Harvey N. Lippman, M.D.*

Cancer of the Rectum; Observations Upon 140 Consecutive Patients. S. H. Wass. *Guy's Hosp. Rep.*, Lond., 1954, 103: 139.

The author presents 140 cases of cancer of the rectum. His personal judgment was exercised in deciding the therapy in each case. For purposes of classification he used Duke's grading: "A" denotes local lesion, "B" extrarectal spread, and "C" lymph node metastases. It was mentioned that this classification does not take into account those lesions which have metastasized; 13.5 per cent of patients had liver metastases at operation. The difficulty of early diagnosis is discussed. Early symptoms may reflect a fast-growing lesion.

Digital examination, proctoscopy, and sigmoidoscopy are discussed and details of the technique are presented. In cases in which the history suggests the presence of a rectal lesion and the visual examination is unsatisfactory, the author advises laparotomy. Biopsy should be adequate, and even though the pathologist is unable to make a diagnosis of cancer, surgery must be undertaken on the basis of clinical findings.

Of this group of patients, 133 were operated upon, and a radical and palliative resection was carried out in 122 cases. The operability rate was 88.3 per cent. Palliative surgery was undertaken in an attempt to alleviate the symptoms incident to the presence of a rectal neoplasm. No pelvic viscerectomies were done although parts of the pelvic viscera were sacrificed. Palliative resection was considered justified even in the presence of liver metastases. Large, bulky tumors should be no deterrent to radical removal. The survival among those patients formerly classed as inoperable is gratifying. Sixteen of 140 patients were so classified on the basis of clinical and/or operative findings.

The type of procedure used was predominantly the combined excision, using two teams. One hundred and twenty-two operations were done with "chance for cure." The author specifies the indication for the various procedures. The synchronous combined excision is best suited for nearly all lesions, with the possible exception of proximal and distal extremes. In some of the proximal lesions an anterior restorative resection may be attempted. Perineal resection is little used except in localized low-lying lesions in poor risk patients. Hartman's operation, leaving the distal stump, is not advocated. The greatest risk is associated with the combined excision, which was used in 89 patients, with death in 16.

Some of the patients have been followed for 7 years. Of the 104 operative survivors, 36 were known to have died, all but 2 from malignant disease. Of the 68 survivors, 28 have lived longer than 3 years. The future prognosis in this group is considered to be good. Most of the survivors were treated by combined rectal resection; however, 6 of the 9 survivors of perineal resection are alive and free of recurrence—2 of these for 7 years, and 2 for 5 years. As yet, the late results of restorative resection cannot be evaluated. Two and 3 year survivals occurred in patients who were known to have hepatic metastases.

The author discusses the operative mortality and morbidity. The leading cause of death was postoperative shock. There is quite a list of nonfatal complications, a number of them requiring reoperation. Genitourinary complications lead the list—more specifically urinary infection, urinary fistulas, and disorders of micturition. Retraction of the colostomy occurred three times, once resulting in fatal peritonitis. The colostomy site is frequently the upper portion of the midline laparotomy incision. Very few complications were associated with the perineal wound. Complications of restorative resections were limited mostly to suppuration at the anastomotic site.

—*Richard L. Lawton, M.D.*

Management of Anorectal Complications of Chronic Ulcerative Colitis. Raymond J. Jackman. *Arch. Int. M.*, 1954, 94: 420.

With the present knowledge, or perhaps lack of it, radical operations such as ileostomy and colectomy will continue to be lifesaving measures in many instances, but exercise of good judgment in the treatment of the anorectal complications in chronic ulcerative colitis may alter the entire course of the disease and in some cases may obviate more radical operation.

During an active phase of the colitis, anorectal operations should be limited to emergency procedures such as incision and drainage of abscesses.

During remissions of the disease, operation for anorectal fistulas is not only permissible but advisable. By this means, recurring abscesses, which may result in a rectovaginal fistula, rectal stricture, or anal incontinence may be obviated.

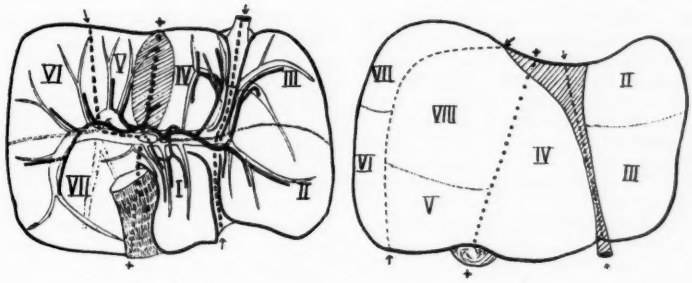
Selection of the proper time to fulgurate polyps complicating chronic ulcerative colitis may be the means of preventing the development of carcinoma in some instances.

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

The Vasculobiliary Sheaths of the Liver, or Glisson's Capsule; Their Importance in Surgery of the Gallbladder, Hepatic Resections, and the Surgical Approach to the Liver Hilus (Les enveloppes vasculobiliaires du foie ou capsule de Glisson; leur intérêt dans la chirurgie vésiculaire, les résections hépatiques et l'abord du hile du foie). C. Couinaud. *Lyon chir.*, 1954, 49: 589.

The liver is enveloped by a fibrous tunic of which there may be distinguished two parts: the one covers the external surface of the organ, that is, the fibrous envelopment of the liver described by Laënnec, and the other occupies the region of the hilus, or undersurface of the organ. The last forms a thickened continuation of the former and sends sheaths along with the vascular and other elements of the hilus into the liver parenchyma. The latter sheathlike extensions are all that should be called Glisson's capsule. Glisson described these sheaths in 1642; the true capsule was described by Valoeus (or Walloeus) in 1640.

The true capsule exhibits 4 principal thickenings (plates): the hilar plate; the cystic plate (above and forming the bed of the gallbladder, tightly attached to the liver, but separated from the gallbladder by loose areolar tissue); the umbilical plate (occupying the fossa of Rex), and the arantian plate (occupying the fossa of Arantius).



a b

FIG. 1 (Couinaud). a, View of the liver from the inferior surface, showing the segmentation: unshaded vascular contours are the portal vein, the dark, heavy lines are the hepatic artery, the line of large dots, marked at its extremities by crosses is the main scissura, the interrupted heavy line with its extremities marked by arrows is the left scissura. The right scissura is marked by a slender interrupted line. A double dotted line, extending transversely across the surface of the liver separates the organ into anterior and posterior portions. b. View of the liver from the upper surface.

The cystic plate is of particular significance in the surgery of the gallbladder because of the necessity for avoiding bothersome bleeding during cholecystectomy; this should be done between the plate and the gallbladder, and not between the plate and the liver parenchyma (subperitoneal cholecystectomy).

Next in surgical importance is the hilar plate. This structure, forming the floor of the hilar fossa of the liver and sending heavy sheaths of fibrous tissue along with the structures entering the liver through this area, is much better defined and much thicker and more extensive than is its classic conception. It is through this plate that the operator must penetrate in order to get at the bile ducts—a difficult and delicate procedure when done from below—particularly in those instances in which the bifurcation into the right and left hepatic bile ducts is situated above this part of the capsule of Glisson. In this connection Johnston and Anson (*Surgery, Gynecology & Obstetrics*, 1952, 94: 660) have stated that the bifurcation is never very far from the base of the quadrate lobe (Spigelius), and they recommend that in the instances in which the region of the hilus of the liver is extensively involved in inflammatory adhesions, the region of the bifurcation be approached by following backward along the lobe of Spigelius to its posterior, or juxtahilar tip. This anatomical arrangement has not been verified by the author in his dissection material and he suggests that it might in many instances be easier and safer to split the liver parenchyma as far as the upper surface of the hilar plate from above and along the main avascular, or parvivascular plane (Fig. 1). By this approach the bile ducts are easily located since they lie on top and are rarely crossed by any arterial branch, and they are safely attacked surgically.

These relatively avascular planes (scissurae) are also available in attempting relatively bloodless resections of the liver parenchyma. Through these scissurae, again, the vascular pedicle at the hilus is approached and the blood vessels are ligated above the hilar plate without the necessity of penetrating this structure.

Figure 1 shows the scissural planes to be followed in hepatic resections. The left fissure permits a relatively easy approach to the hilar region from above, with hilar ligations of the appertinent vascular and ductal structures, and removal of the left lobe of the liver itself. Together with the utilization of this left scissural plane, the right, or main, scissural plane may be traversed for the supposedly impossible resection of the hepatic centrosuperior lobe of the liver, the territory most frequently involved in tumor development and other disease requiring resection for cure. The conditions relating to the causal affection (volume of the tumor, adhesions, propagations of a neoplasm from the neighboring organs) which render the approach from the lower hepatic surface difficult or impossible, are the signal for the consideration of the scissural approach, an approach which renders possible the majority of the major hepatectomies.

—*John W. Brennan, M.D.*

Primary Carcinoma of the Liver; a Review of 18 Autopsied Cases. GEORGE F. CAMERON. *Gastroenterology*. 1954, 27: 161.

THE AUTHOR has reviewed a series of 18 autopsied cases of primary carcinoma of the liver which were seen at the United States Public Health Service Hospital, Staten Island, New York, since 1941.

Primary carcinoma of the liver is predominantly a disease of middle-aged males and is associated with Laennec's cirrhosis in about 85 per cent of the cases. Among the malignancies observed at autopsy, the disease was seen most frequently in the dark-skinned races, although such was not the case in this series. The diagnosis was seldom made in this group of patients prior to surgical intervention or autopsy. When an antemortem diagnosis could be made it was invariably too late even for heroic surgery. A positive diagnosis was not made before death or operation in 12 of the 18 patients.

At autopsy, 10 of the 18 patients were found to have been poorly nourished, 12 were jaundiced, and in 16

cases there was an average of 2,000 c.c. of icteric ascitic fluid. In one-third of the patients there was pleural effusion which was always associated with metastatic lesions to the lungs. A tawny "hobnailed" cirrhotic liver was seen in 10, or 61 per cent, of the 18 cases. Tumor masses occurred in both lobes of the liver in 8 cases, in the right lobe in 8 cases, and in the left lobe in 2 cases. The tumors measured from 1.5 to 15.0 cm. in diameter and varied in color from brown to red or yellowish gray. They were usually lobulated and round and were either softer or firmer in consistency than the cirrhotic nodules. One cholangioma and 17 hepatomas were observed; of the latter, 3 were single, 12 multinodular, and 2 diffuse.

The tumor process extended beyond the liver in 13, or 73 per cent, of the 18 patients. Although the gallbladder showed secondary changes in 10 cases, there was no evidence of tumor involvement in any of these. The spleen was usually enlarged with an average weight of 351 gm. Congestion, edema, and bronchopneumonia were frequent findings in the lungs. Six of the 18 patients presented pulmonary metastases, all of which were bilateral. Esophageal varices of considerable size were noted in 12 patients. In 4 of these the varices had ruptured.

Associated lesions which were apparently related to the primary tumor of the liver and considered to be the immediate cause of death included: hemorrhage from esophageal varices in 5 cases, intestinal obstruction due to adhesions to the tumor in 1 case, acute peritonitis in 1 case, pulmonary edema and congestion in 8 cases, and bronchopneumonia in 1 case. The direct toxic and debilitating effects of the tumor were considered to be the cause of death in the remaining cases.

Microscopically, the hepatomas simulated liver cells and lobular patterns, while the cholangiomas simulated ducts and produced thick stroma around the portal areas. The hepatomas generally were composed of large polygonal cells up to 50 microns in diameter with poor cell outlines. The nuclei usually occupied more than half of the area of the cell and showed distinct borders, heavy chromatin, and large nucleoli. Giant cells with as many as 20 nuclei were commonly seen. The cholangiomas formed acini and long ductlike structures. The cells were columnar with small amounts of mucus and small oval nuclei. The stroma was very thick and moderately infiltrated with chronic inflammatory cells. No bile formation was noted. Tumor giant cells were not seen and mitoses were infrequent. None of the tumors showed any mixture of hepatomatous and cholangiomatous elements. Metastatic lesions usually reproduced the pattern of the primary tumor. —*Harvey N. Lippman, M.D.*

Perforation of the Gallbladder in Acute Cholecystitis. Bernard Pines and Jacob Rabinovitch. *Ann. Surg.*, 1954, 140: 170.

The authors' investigation discloses that the shorter the interval between the onset of symptoms and operation, the better the prognosis. Thirty patients in their series were hospitalized immediately after the onset of symptoms, but operation was delayed from 3 to 27 days, with a mortality of 20 per cent. Sixty other patients were not hospitalized until several days after the onset of symptoms, but were operated upon soon after admission, with a mortality of 16.6 per cent. Evidently there was little difference in the mortality rates among patients who were hospitalized late and operated upon early. The over-all mortality in the entire group was 17.7 per cent. The length of history has a definite bearing on the outcome of the disease; the longer the duration of symptoms, the greater is the likelihood of complications and higher mortality rates.

The use of antibiotics and chemotherapeutic agents did not appear to have perceptibly influenced the mortality in cases of acute cholecystitis and perforation. However, these drugs were not always administered at the onset of the disease when they would have been most effective. Three of 19 patients who received antibiotics and chemotherapy died, giving a mortality of 15.7 per cent.

In the authors' series, cholecystectomy was done in 28 patients with perforation of the gallbladder, and in 4 others the common duct was drained. There were 2 (7 per cent) deaths in this group. Partial cystectomy was done in 3 cases with 1 death. In 43 cases cholecystostomy was performed with 9 (20 per cent) deaths. In 9 instances incision and drainage of an abscess cavity were done, with the removal of calculi; 4 (44 per cent) of these patients died. The mortality rate of the entire group was 17.7 per cent. This is a lower figure than that reported by most observers. Eight patients had previous cholecystostomies from 1 to 18 years previously; 5 of these patients had recurrent local abscesses and 3 had free perforations. There were 2 deaths.

There were 60 patients with acute, walled-off perforations; 53 showed localized pericholecystic and subphrenic abscesses. In 3 patients there were perforations into the liver, in 1 patient there was a perforation into the anterior abdominal wall, and in another there was one into the colon. The remaining 2 cases presented perforations into the duodenum. There were 9 deaths, a mortality rate of 15 per cent. Of the remaining 30 patients with free perforation, 7 died, a mortality of 23.3 per cent. The peritoneal cavity in 14 of the latter group of cases contained free bile and fibrinous exudate, in 9 it contained a seropurulent exudate mixed with bile, and in 4 it contained brown, fetid, and sanguinopurulent fluid. Eight of these patients had no previous attack of gallbladder disease.

In the present series the gallbladder showed evidence of an acute inflammatory process in every instance. The lumen contained either a thin or viscid fluid, or thick grumous material. The mucosa was often coarsely granular, shaggy, necrotic, or ulcerated. The pathologic change seen in the gallbladder did not always conform with the clinical picture. Two of the perforated gallbladders showed a mural carcinoma. Perforation in each instance was not related to the neoplasm. There were impacted calculi in the cystic duct in both cases.

The fundus of the gallbladder was the most common site of perforation. The site of perforation was recorded in only 59 instances in the present series. Of these, 37 were in the fundus, 12 in the cystic duct, 4 in the neck and ampulla, 2 in the body, and 4 in multiple locations. No visible perforation was noted in 2 cases.

Forty-seven patients showed multiple calculi and 21 solitary stones. The stones in the latter group were

mostly smooth and oval. In 10 instances the stones were impacted in the cystic duct and in 2 in the ampulla.

Since the signs and symptoms of perforation of the gallbladder are not distinctive, and consequently a correct diagnosis is seldom made preoperatively, there can be no doubt that failure to make an early diagnosis, delay in hospitalization, and procrastination in operative intervention are factors responsible for the high morbidity and high mortality rates in cases of gallbladder perforation.

The optimum time for surgery is 24 to 48 hours after hospitalization, when the patient has been adequately prepared. It is obvious that complicating factors such as diabetes, or pulmonary or cardiac disease, may require short periods of delay for their proper adjustment.

The prime requisite for the successful management of acute cholecystitis and perforation is adequate preoperative preparation. The gastrointestinal tract is put at rest; gastric intubation and continuous Wangensteen suction are instituted. Parenteral alimentation is begun and electrolyte balance is maintained. Blood is given if necessary; vitamins B, C, and K are commonly used. Complicating diseases are treated as they arise. The authors' relative low mortality is probably due to adherence to these principles.

—Robert Turell, M.D.

Results of Cholecystectomy for Biliary Dyskinesia (L'avenir des cholécystectomisés pour dyskinésie vésiculaire). Guy Albot and G. F. Bonnet. *Arch. mal. app. digest.*, Par., 1954, 43: 785.

This discussion is limited to a consideration of inflammation of the gallbladder not associated with cholelithiasis. Most patients in whom cholecystectomy is done for biliary dyskinesia not associated with calculi will receive a good result, but in about 20 per cent the results are poor. These patients should be carefully evaluated preoperatively, and particular attention should be paid to their psychiatric status.

Careful consideration should also be given to the preoperative differential diagnosis in these patients and symptoms arising from disease of the liver itself, or the stomach or colon should be evaluated.

Symptoms arising from organs other than the gallbladder are not permanently relieved by the removal of a diseased noncalculus gallbladder.

Nine patients in this category with biliary tract symptoms had migraine headaches. Following cholecystectomy there was no improvement either in the symptoms attributed to the biliary tract or to the migraine.

Twenty patients with biliary dyskinesia were given a psychiatric examination; 5 were considered normal, and 15 were found to be suffering from minor psychiatric disturbances such as psychosomatic disorders, anxiety reaction, and other neuroses. Symptoms related to the biliary tract were not relieved except in 1 patient in this group, whereas the 5 normal patients received satisfactory results.

There is a category of patients who have a painful condition of the right upper quadrant and tenderness of the liver. This is an obscure ailment possibly related to increased pressure in the biliary tract. Cholecystectomy will not relieve the symptoms in this condition.

Biliary dyskinesia sometimes is secondary to gastrointestinal disease. A case of peptic ulceration of the stomach and biliary dyskinesia not associated with calculus is cited. Correct management of this type of case is control of the peptic ulceration. No beneficial effect can be anticipated from removal of the gallbladder.

—Frederick W. Preston, M.D.

Carcinoma of the Body and Tail of the Pancreas; a Study Based on 20 Cases. R. M. Dunn and A. B. Conomy. *Med. J. Australia*, 1954, 2: 277.

Current medical teaching stresses the symptomatology of carcinoma of the head of the pancreas (painless jaundice, enlarged gallbladder, and progressive weight loss), but very little is taught about the findings in carcinoma of the body and tail of this organ. Yet it is probable that carcinoma of the head of the pancreas occurs much less frequently than carcinoma of the body and tail. In the present series 20 confirmed cases of carcinoma of the body and tail were collected in contrast to 5 cases of carcinoma of the head over a 3 year period at Repatriation General Hospital, Concord, Australia.

Carcinoma of the body and tail of the pancreas tends to extend much more massively and to metastasize more widely and at an earlier stage than carcinoma of the head. The average time from the appearance of the first symptom until death was 9 months. The main symptoms were: central and left upper abdominal pain radiating to the left lower thoracic region and the back, loss of weight, asthenia, constipation, anorexia, vomiting, and steatorrhea.

Physical signs may be minimal until very late. Hepatic enlargement is a frequent finding. Ascites occurs occasionally; in 1 case chylous ascites was present. Jaundice appeared in 4 cases and was due to secondary deposits in all of them. In 4 cases the left supraclavicular gland was palpable, and in 2 cases inguinal and axillary lymphadenopathy was noted. Thrombophlebitis migrans in the lower extremities occurred in 2 cases.

Diagnosis is usually established only within a few weeks of death, as a rule. In 17 of the 20 cases in this series, findings were suggestive enough to be confirmed at exploratory laparotomy. One patient was operated upon for a suspected lesion and was found not to have it. Early laparotomy is recommended in the hope that the presenting lesion may be operable.

—Harold Laufman, M.D.

Splenoportography for Visualization of the Spleen, the Liver, and the Portal Vein (L'exploration de la rate, du foie et de la veine porte par la spléno-portographie). Lucien Leger and Charles Proux. *Arch. mal. app. digest.*, Par., 154, 43: 641.

The authors have had 3 years' experience with splenoportography and they find it particularly useful in the diagnosis of the following conditions: parenchymal disease of the liver, particularly cirrhosis; tumors of the liver; splenomegalies; and hemorrhages of the digestive tract. Occasionally it is useful in the diagnosis of pancreatic disease.

A 45 year old woman developed jaundice and ascites several months after an accident in which she fractured her arm. A diagnosis of pylephlebitis was

made. Splenoportography showed that thrombophlebitis involved the intrahepatic branches of the portal vein. The splenic vein, the superior mesenteric vein and collateral veins around the block were demonstrated to be patent.

A 73 year old man with symptoms of pain and weight loss was found to have a tumor in the epigastrium. Splenoportography showed obliteration of the splenic vein and led to the impression that the mass was an inoperable carcinoma of the pancreas. This was confirmed at exploratory laparotomy.

In patients with cirrhosis, the technique is useful in demonstrating portal hypertension and in determining the site of intrahepatic venous obstruction. The venous circulation in the right lobe of the liver can be readily outlined; the left lobe, less so. Collateral circulation can be readily visualized.

Tumors of the liver usually cause distortion of the venous circulation and can be demonstrated by splenoportography. A case is cited in which a small metastasis from a carcinoma of the rectum in a postoperative patient was discovered. —*Frederick W. Preston, M.D.*

A Study of the Circulation of the Blood in the Spleen of the Living Mouse. Allen O. Whipple, Arthur K. Parpart, and Joseph J. Chang. *Ann. Surg.*, 1954, 140: 266.

For the past century, there has existed a recurring controversy concerning the histology and physiology of the vascular communications between the arteries and veins of the spleen. A study was therefore undertaken to record objectively the living circulation in the spleen of the mouse, by means of colored and black and white movie films.

The afferent arterioles are relatively narrow and thick-walled; they show a more rapid blood flow than the other vessels, so fast as to prevent differentiation of the blood cells and platelets; they are lined by endothelium; many terminate in funnel-shaped ampullae (Thoma); and they empty into pulp spaces and venous tributaries, capillaries, and arteriovenous anastomoses.

The efferent veins are wider and thinner-walled than the arterioles; they are lined by endothelium; the blood flow is relatively slower, and permits differentiation of the blood cells and platelets; they receive blood from the pulp spaces, the so-called sinuses, and from arterioles, and empty into the larger collecting veins.

The sinuses cannot be differentiated from the smaller veins. In spleens that are allowed to thrombose with a markedly slowed circulation, they appear to be better differentiated as vessels in which there is a slower flow, a reversed flow, or a lack of blood flow. They receive blood from the arterioles, capillaries, and pulp spaces, and give blood to pulp spaces and the larger veins. The three phases of filling, concentrating, and emptying were not observed in these so-called sinuses, nor were sphincters seen at the entrance or exit. The mouse spleen with normal, exceedingly rapid, and amazingly profuse blood flow shows no evidence of "sinuses."

The pulp spaces and channels are completely irregular in pattern; they occupy the spaces between the endothelial-lined vessels and the splenocytes and reticulum of the pulp. They are devoid of endothelium. The blood flow is totally irregular in rate, amount, and direction, is often stationary for long periods, and often reverses its direction. The blood cells appear to wander aimlessly through the pulp spaces. They receive blood from the ampullae of the arterioles, from the capillaries, and from veins, and empty into the latter.

The splenic circulation in the mouse appears to be a combined open and closed one. The blood flows from the arteries into both pulp spaces and venous channels.

Certain clinical splenomegalies seem to offer corroborative evidence in favor of the combined open and closed splenic circulation. —*Samuel Kahn, M.D.*

GYNECOLOGY

UTERUS

Cancer of the Cervix in Jewish Women. WILLIAM B. OBER and LEOPOLD REINER. *N. England J. M.*, 1954, 251: 555.

CARCINOMA OF THE CERVIX UTERI occurs much less frequently in Jewish than in non-Jewish women. In the defined hospital population (Beth Israel Hospital, Boston) of this report the ratio was 1 to 9. By contrast, carcinoma of the corpus uteri occurs about as frequently in Jewish as in non-Jewish women. In the same population the ratio was 1 to 1.25. The data from which these ratios are derived were based exclusively on histopathologically confirmed cases of carcinoma of the cervix and corpus uteri.

—Alan Rubin, M.D.

Radioresistant Cervical Cancer. EDMUND R. NOVAK. *Obst. Gyn.*, 1954, 4: 251.

IRRADIATION is generally recognized as the usual treatment for cancer of the cervix, but surgery has a definite place, especially in cases in which irradiation has failed.

Prompt confirmation, by biopsy, of radioresistance is of paramount importance, but is so beset with variables and technical difficulties that the correlation of radiation histology and prognosis has been impossible.

A study of 12 cases in which treatment by irradiation failed and radical surgery was performed has reaffirmed previous impressions as to the relative resistance of the spinal type of tumor, but suggests that pure tumor strains are rare, and the degree of differentiation in the accepted sense does not parallel neoplastic tendencies. Broders' plan for grading according to cellular activity seems a more reliable guide than one based solely on degree of differentiation.

The patchy localized response to irradiation is one of the most striking variables and further emphasizes the probability that random biopsy alone can never be the criterion of tumor behavior following treatment.

—Charles Baron, M.D.

Fibrosarcoma of the Abdominal Wall Secondary to a Postoperatively Irradiated Cervical Carcinoma (Fibrosarcoma da parede abdominal secundário à irradiação post-operatória em carcinoma da cervix). P. BARATA RIBEIRO and WALTER FERRARI. *Rev. brasil. cir.*, 1953, 26: 591.

THE PATIENT discussed was a 43 year old white woman who had undergone a vaginal hysterectomy in 1944, by the technique of Schauta-Peham-Amreich, for epithelioma of the uterine cervix. At this time a total irradiation of 19,600 roentgens was administered through the usual channels, including 800 roentgens given intravaginally.

The patient recovered and was quite well until 1949 when she was again admitted to the hospital with a large ulcerated mass (5 cm. in diameter) near the inguinal fold on the anterior surface of the right lower quadrant of the abdominal wall. The removal of this tumor at the second operation entailed exposure of the underlying peritoneum. This was therefore detached and pushed medially, so that the retroperitoneal tissues could be followed as far as the bifurcation of the aorta. However, in all of this tissue there was no evidence of residual cancer cells or of recurrent tumor from the original cancer of the cervix. It would seem that the original condition had been cured, supposedly in the main by the large dosages of irradiation therapy.

Histologic examination of the tumor tissues removed at the second operation revealed part of a fibrosarcoma of the abdominal wall. Proliferation of atypical fibroblasts of large size with hyperchromatic nuclei were observed to be intercrossing in all directions. Some of these cells were of enormous size, with accentuated kariokinetic activity and a predominance of atypical mitoses.

The local tumor recurred rapidly, the patient dying a month later of hemorrhage.

This tumor, developing in an area of the abdominal wall and showing marked changes (cicatrization; varicosities) due to the irradiation therapy administered for the original cervical cancer, was the result of the cancerogenic stimulus of the roentgen irradiation itself. The stimulus arose from a too high dosage, too little screening, or, just possibly, some special susceptibility in the patient's own tissues. In any of these contingencies, of course, the tumor would represent a true irradiation sarcoma.

From the afore-mentioned considerations the authors believe their case to be one of irradiation sarcoma, resulting from the roentgen treatment applied for the original cervical cancer. However, they merely concur in this opinion, along with the statements of authorities.

Hesse states that he would consider a neoplasm as resulting from irradiation therapy when it develops in an organ primarily free of tumor, not presenting any particular predisposition to tumor previously, and presenting tumor at variable intervals after having received sufficient of the rays to provoke a biologic reaction.

Finally, the authors find their case in perfect accord with that of Lacassagne, in the discussion of which this authority remarked that the direct intervention of the irradiation in the development of the lesion is proved by its location; this cancer always appears—and it may be in multiple locations—in the regions particularly exposed to the irradiation stimulus.

—John W. Brennan, M.D.

Carcinosarcoma of the Uterus with a 10 Year Course (Karzinosarkom des Uterus mit Zehnjaehrigem Verlauf). HANNS-WERNER BOSCHANN. *Geburtsh. & Frauenh.*, 1954, 14: 846.

THE AUTHOR REPORTS the seventieth case of carcinosarcoma of the uterus. A 10 year duration of the lesion makes it all the more unusual.

The patient was a 71 year old unipara who had been well until 1943, at the age of 61, when she experienced postmenopausal flooding. Curettage was performed. In 1953 the patient again had uterine bleeding, at which time she was treated by curettage and 2,100 mgm. hours of radium in the uterine cavity, followed in 1 week by complete hysterectomy and bilateral salpingo-oophorectomy. The patient died 5 days after the operation from hypostatic pneumonia, and at postmortem examination no metastases other than a small metastatic area to the pelvic bone were found. Although the curettings from the first curettage were originally reported as hemangiosarcoma, a review of these and a thorough study of later sections disclosed the primary diagnosis to be carcinosarcoma.

—Warren R. Lang, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

The Dysgenetic Thyroid Tissue of the Ovary and the Tumors Which Are Derived from it (Le tissu thyroïdien dysgénétique de l'ovaire et les tumeurs qui en dérivent). L. FRUHLING, J. DELAGE, and FR. BILL. *Gyn. obst.*, Par., 1954, 53: 344.

A STUDY of 179 ovarian teratomas encountered between 1937 and 1952 at the Institute of Pathologic Anatomy, Strasbourg, France, revealed a 14.5 per cent incidence of thyroid tissue. On a clinicopathologic basis, the thyroid tissues could be classified in three groups: simple organoid (9 cases); hyperplastic organoid (7 cases); and thyroid neoplasms (10 cases). One of the neoplasms proved to be malignant.

Individual case histories are presented. The organoid lesions are described as microscopic collections of thyroid tissue usually located in close proximity to tracheal mucosa. The neoplasms were larger, grossly visible growths of thyroid tissue—often found without any adjacent tissue to suggest the teratomatous origin. This was thought to be the result of the compressions and obliteration of the nonthyroid tissues by the growing tumor. Three of the ovarian thyroid adenomas were associated with a hyperthyroid syndrome. One of these appeared to be due to the direct action of the thyroid tissue in the ovary. Another seemed to result from overactivity of both the cervical and ovarian thyroid as determined by the uptake of radioactive iodine. The last adenoma seemed by indirect influence to cause over activity of the cervical thyroid.

—George C. Lewis, Jr., M.D.

EXTERNAL GENITALIA

The Significance of the Positive Vaginal Smear. NEIL W. SWINTON and ANTHONY J. SAELI. *Surg. Clin. N. America*, 1954, 34: 785.

THE Papanicolaou smear technique has been used at the Lahey Clinic, in Boston, for the evaluation of 4,353 patients from July 1947 to July 1952. The test was applied on patients with a cervical lesion or with abnormal menstrual function. A few elective smears were done in cases considered free of abnormalities. There were no examinations of obvious malignancies or previously irradiated structures. Positive smears were obtained in 2.1 per cent of the patients, questionable smears in 3.8 per cent, and negative smears in 94.1 per cent.

As the technicians screening the smears gained greater experience, fewer questionable smears were reported. Histologically, 62 per cent of the positive smears were proved to be correct. Only a relatively small group of negative smears could be thoroughly checked but, of these, 2 per cent were found to be false negatives, the majority proving to be endometrial lesions. Eighteen per cent of the positive smears were proved to be false; the remaining cases are still under surveillance. In a previous report, 27 positive smears were noted in the first 1,000 patients examined. Sixty-three per cent of these positive smears were confirmed. Further evaluation of these cases has raised the proved per cent to 74. Because of this finding it was believed that a positive smear indicates complete investigation and close follow-up. Hysterectomy should receive consideration in the management of good-risk patients over 40 whose smear contains cancer cells and whose diagnostic studies fail to indicate the site of a lesion. Further investigations are indicated to support this positive statement.

—George C. Lewis, Jr., M.D.

MISCELLANEOUS

Renal Function After Complete Bilateral Ureteral Obstruction Following Colporrhaphy. BENEDICT R. HARROW. *Am. J. Surg.*, 1954, 87: 842.

THIS report is a presentation of the ninetieth patient in the English literature with complete bilateral ureteral obstruction following gynecologic surgery. When the kinking could not be freed suprapubically a right nephrostomy was performed. The other kidney remained completely obstructed, yet, interestingly enough, iodide visualization was obtained on the thirteenth day, and although it remained obstructed for 23 days, follow-up urograms after 4 months revealed a normal pyelogram.

The experimental and clinical data of renal function and the low secretory pressure continuing in hydronephrosis during complete obstruction are discussed, the author concluding that the main mechanism is glomerular filtration and urothelium reabsorption.

The author suggests that bilateral nephrostomy or intubated ureterostomy rather than deligation are the procedures of choice even after vaginal surgery. Insertion of ureteral catheters in secondary colporrhaphy or in anticipated difficult abdominal surgery is strongly advised as a preventative measure.

—Ely Elliott Lazarus, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Management of Diabetes in Pregnancy. RUSSELL J. PAALMAN. *Obst. Gyn.*, 1954, 4: 302.

THE PRINCIPLES underlying present-day concepts of the treatment of diabetes in pregnancy are discussed. The cases of 8 patients (12 pregnancies) who were given diabetic treatment during pregnancy are presented. Meticulous supervision of the pregnancy by the obstetrician and careful control of the diabetes by the internist are the two most vital requisites for a successful outcome in these cases.

Supplemental therapy with hormones appears to reduce the maternal complications and to improve fetal salvage. These patients should be delivered after the thirty-third week, but before the thirty-eighth week of gestation.

The problems of prematurity, hypoglycemia, and edema in these infants should be recognized and appropriately treated. —*John R. Wolff, M.D.*

Prophylactic Hormone Therapy; Relation to Complications of Pregnancy. GEORGE V. SMITH and OLIVE W. SMITH. *Obst. Gyn.*, 1954, 4: 129.

EXPERIENCE indicates the value of prophylactic stilbestrol therapy. This conclusion is based on observations in more than 1,300 clinical trials, in a large number of which the urinary pregnandiol as well as the clinical results were evaluated. It is supported by the clinical judgment of the many obstetricians who have followed the authors' recommendations since 1944 and continue to prescribe stilbestrol.

Pregnandiol studies and clinical observations show that overdosage in the early weeks and the erratic taking of stilbestrol at any time may actually precipitate disturbances in women with borderline placental function. It is recommended that preventive stilbestrol therapy is started just as soon as pregnancy is diagnosed in the categories listed, and that the schedule of increasing dosage be carefully followed with particular attention to the avoidance of overdosage during the early weeks. These recommendations are made with the full expectation that there will be failures, but the fundamental observations have been confirmed, the reported failures to confirm them have been explained, and the results in Boston continue to indicate that stilbestrol administered prophylactically is reducing fetal wastage. —*John R. Wolff, M.D.*

LABOR AND ITS COMPLICATIONS

The Management of Labor in a Contracted Pelvis. HECTOR R. MACLENNAN. *Brit. M. J.*, 1954, 2: 837.

SIGNIFICANT CHANGES have occurred during the last 50 years in the methods of managing labor in patients with contracted pelvis. Internal podalic version and destructive operations on the fetus have now almost disappeared and classical cesarean section has been largely superseded by the lower segment operation.

There has been a decrease in the severity of contracted pelvis during the last 50 years; however, the rachitic factor continues to be important in the production of present-day pelvic contraction. Minor degrees of pelvic contraction are an important cause of dystocia in labor.

The tendency towards an ever-increasing elective cesarean section rate is fully discussed and criticized, and an attempt has been made to justify the use of trial of induction of premature labor (thirty-sixth to thirty-eighth week) in specially selected cases.

In instances in which there is a minor degree of pelvic contraction, premature surgical induction may initiate labor at a point where disproportion is minimal or nonexistent. If such induction fails, or pelvic contracture proves too great, cesarean section can then be undertaken with safety.

—*Alan Rubin, M.D.*

MISCELLANEOUS

Traumatic Menstrual Insufficiencies Secondary to Surgical and Obstetrical Artificial Evacuations of the Uterus (Les insuffisances menstruelles traumatiques, secondaires aux évacuations utérines artificielles, chirurgicales et obstétricales). RENÉ MUSSET and YVETTE SALOMON. *Rev. fr. gyn. obst.*, 1953, 48: 311.

THE AUTHORS present their personal observations in 19 cases of traumatic menstrual insufficiencies. In 18 of the 19 cases the symptoms followed curettage; in 7 cases the curette was used after delivery.

In 18 of the patients, the authors were able to demonstrate operatively, or by means of hysterosalpingography, the presence of intrauterine adhesions. In the 1 instance in which there appeared to be no adhesions the etiology was not apparent; however (as in the case of a patient of Jacob Mezer, reported in *J. Am. M. Ass.*, 1949, 141: 603), the hysterosalpingographic shadow of the uterine cavity was slightly irregular in outline. The authors desired to attempt hormone treatment along the lines suggested by Mezer; however, this patient could not be located.

In the 19 cases of intrauterine adhesions, the lesions were classified into three groups: total synechia, 2 cases; corporeal synechias, 13 cases; and cervicoisthmic synechias, 4 cases. In opposition to Ascherman, who maintained that the majority of traumatic amenorrheas were instances of isthmic synechia, the authors were able to demonstrate, by hysterosalpingography or operation, that incidences of corporeal synechia are much more numerous.

The best method of treatment of these patients is, of course, prophylactic. In the presence of ovular retentions in abortions, post-partum hemorrhages and bleeding during the puerperium and postpuerperal periods, manual evacuation of the retained tissues should not be attempted unless it is unavoidable. Curettement should not be done except under conditions of absolute necessity, and should then be carried

out with a noncutting curette. The cervix should be adequately dilated and the internal orifice should be guarded as much as possible. Finally, evacuation should be delayed wherever possible until the ovarian content has been loosened by posthypophyseal extracts; the actual evacuation should be carried out preferably with the finger (less brutal and less blind). In instances in which the curette cannot be avoided, it is better to place a rubber drain of the Mouchotte type in the uterus, under antibiotic protection, for several days. In the after care, frequent control should be provided so as to diagnose, by hysterometry or hysterosalpingography, the developed synechias while they are still recent enough to be separated by a simple dilatation.

When the adhesions have become organized, the best treatment is the combined abdominal and perineal procedure. The perineal operator dilates the cervix, the abdominal operator's hand grasping the uterus and guiding the dilators; then the abdominal operator opens the uterine cavity by a transverse fundal hysterotomy and loosens the synechia, or synechias, with the finger, or a cutting instrument. Hysterectomy was necessary in 3 instances.

From the viewpoint of function, the results obtained by the authors have been excellent; the menstrual flow reappeared in every instance with normal abundance. In 3 of these patients an infiltration (cellulitis) and marked vasomotor troubles disappeared rapidly.

Two pregnancies have resulted since the treatment. In one severe case the pregnancy is in the second month; in a mild case it is in the seventh month. In both, the gravid stage appears to be entirely normal in its course. —*John W. Brennan, M.D.*

Uterine Gangrene Originating in an Abortion (Gangrène utérine d'origine abortive). P. Gellé and Francis Duthoit. *Bull. Fed. Soc. gyn. obst.*, 1954, 6: 56.

The patient was a 27 year old woman who had entered the clinic in a state of extreme collapse, with biliary vomiting, retention of feces and gas, and a condition of anuria of 2 days' duration. The history elicited an attempt at abortion of a 2 months' pregnancy which, after several days, resulted in the expulsion of a fetus and abundant bleeding. Following this, sulfonamides were prescribed in allegedly normal dosage (10 tablets of thiazomide daily). Two days later the vomiting and abdominal pains resulted in hospitalization.

The patient was put on large doses of the antibiotics (1 gm. of streptomycin and 1,000,000 units of penicillin), antitetanic serum as a preventative, glucose and saline, cardiotonics, and continuous oxygen.

Under this medical regimen, diuresis was gradually resumed, the blood urea sank, and all other manifestations of intoxication regressed, with exception of the temperature. Laparotomy was then carried out. The uterus was found to be gangrenous and a practically total hysterectomy was performed. The patient recovered.

The authors believe that an immediate operation on this patient would have resulted in certain death; therefore, in these cases they recommend complete medical management until the focus of infection is more or less brought under control and diuresis is resumed. At this time a hysterectomy should be carried out as the sole means of suppressing the gangrenous process. It is believed that it would be unwise to count exclusively on the sterilizing action of the antibiotics. —*John W. Brennan, M.D.*

The Causes and Prevention of Stillbirths and First Week Deaths; a Classification of Deaths by Clinical Cause: the Effect of Age, Parity, and Length of Gestation on Death Rates by Cause. D. Baird, J. Walker, and A. M. Thomson. *J. Obst. Gyn. Brit. Empire*, 1954, 61: 433.

Autopsy fails to explain the true cause of demise in many cases of stillbirths and deaths during the first week although it may indicate the immediate cause such as anoxia or prematurity. The authors, therefore, have attempted to classify such deaths according to the clinical findings by examining the records of 1,008 stillbirths and of deaths during the first week occurring among 26,116 booked Aberdeen Maternity Hospital patients (single births only) delivered during the 15 year period from 1938 to 1952.

About one-third of the deaths were clinically unexplained in the sense that pregnancy and labor were normal. These were classified under "premature, cause unknown" and "mature, cause unknown" on the basis of birth weight. In the remaining cases, deaths due to birth trauma, toxemia, antepartum hemorrhage, fetal deformity, maternal disease, and other factors were differentiated.

The incidence of deaths in the "trauma" and "mature, cause unknown" groups rises steadily with maternal age, especially in primigravida. Death rates from most causes except "deformity" and "antepartum hemorrhage" are high in primigravida aged 30 and over. Death rates in the "premature, cause unknown," "toxemia" and "deformity" groups tend to be high in the youngest age groups, and those in the "premature, cause unknown" group are particularly high in young multigravida. The death rate in the "mature, cause unknown" and "trauma" groups rises when pregnancy goes past term, a phenomenon probably associated with defective fetal oxygenation and a relatively high incidence of difficult labor in cases of postmaturity.

It is suggested that the aging process, especially in primigravida, is associated with a decline of reproductive efficiency and a corresponding rise in the death rate from obstetric causes. On the other hand, many deaths from "trauma" are now being eliminated by cesarean section. The advantages of youth are sometimes outweighed by poor growth and poor general health. The lowest possible rate for stillbirths and deaths during the first week cannot be reached by good obstetric care alone but must be based on a higher level of health among mothers and reproduction at more favorable ages. More epidemiological research along these lines is urgently needed.

—*Warren R. Lang, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Masculinizing Adrenal Tumors; Recurrent Hirsutism in Bilateral Adrenal Tumors (Zur Frage der vermaennlichenden Nebennierentumoren rezidivierender Hirsutismus bei doppelseitigen Nebennierenrindenadenomen). HERBERT F. J. WEBER. *Zschr. Urol.*, 1954, 47: 406.

TUMORS of the adrenal are not common. In 1936 Kraus was able to gather and to report on only 76 cases. Adrenal tumors are classified according to their origin, viz., tumors of the cortex, of the medulla, and of the interstitial layer. Adrenal tumors may give rise to no particular symptoms or may produce marked changes in the organism. In children, the tumors cause precocious puberty. Eighty-one per cent of these tumors occur in females. In postpubertal women such tumors cause infrequent menstruation and diminution of the menstrual flow. Hirsutism, with the appearance of a beard and male distribution of body hair is often noted; the breasts become smaller and the clitoris larger; libido decreases. This syndrome can be due to adrenal cortical hyperplasia, adrenal tumors, or cancers.

The diagnosis of adrenal cortical tumor is not easy. Hirsutism is its most pathognomonic symptom. Glycosuria, hypertension, and polycythemia may also be present. The tumors can sometimes be recognized in the plain film of the abdomen or can be suspected on the basis of displacement of neighboring organs, such as kidney, stomach, or intestine. Retroperitoneal air insufflation can be helpful. In the urine of women, male hormones may increase a hundred fold and the 17-ketosteroid determination of the urine, therefore, becomes important. According to Bauer, the adult male, up to the age of 50, has 12 to 20 mgm. of 17-ketosteroids per liter of urine. In women it amounts to 9 to 14 mgm., and in children, 1 to 5 mgm. per liter of urine. It is preferable to estimate the amount of 17-ketosteroid excreted per liter instead of the amount in the 24 hour urine specimen since the daily excretion of these steroids may vary.

In the differential diagnosis, Cushing's syndrome and arrhenoblastoma of the ovary must be considered. It is most difficult to determine the presence of adrenal cortical hyperplasia and if hirsutism is marked and the 17-ketosteroid excretion in the urine is elevated, exploration of the adrenal may be advisable to establish the diagnosis.

The following forms of adrenal cortical tumors are recognized (according to I. Becker): (1) fetal, (2) infantile, (3) postpubertal, (4) menopausal, (5) pluriglandular.

The author reports the case of a girl of 21 years who has had increasing hirsutism since the age of 17, requiring daily shaving; the menstrual flow became scanty and lasted only a day; the clitoris was enlarged; the vagina was contracted and narrow and the uterus was small. There was a tumor mass in the left upper quadrant. This turned out to be an adenoma of the adrenal cortex which was excised. The patient made a good recovery. Following operation the hirsutism receded. About 6 months after the operation, however, the hirsutism reappeared and became more marked and her habitus became that of a male. On this admission to the hospital, the right kidney was found to be displaced downwards by an adrenal tumor. This tumor, which was 10 by 8 by 5 cm. in size was also removed. The patient made an uneventful convalescence and one year later had a normal female habitus and a normal female distribution of hair. Her menses also became normal.

The author believes that women with hirsutism should be thoroughly studied to rule out possible adrenal cortical tumors or hyperplasia of the adrenal as a cause of such abnormal hairiness. If laboratory findings are inconclusive to establish the diagnosis, exploration of the adrenal should be considered.

—*S. Richard Muellner, M.D.*

Primary Ureteral Tumors (Tumores primitivos del ureter). PEDRO GAUSA. *Cir. gin. urol.*, 1954, 7: 291.

TWO INSTANCES of primary tumor of the ureter are reported.

The first patient was a 68 year old male who, 9 months previously, had suffered total hematuria for a period of 3 urinations, and, 5 days previously, had again suffered total hematuria for a period of 2 urinations, with smarting sensations in the glans penis during micturition. Palpation disclosed a rather resistant, irregular mass filling the left hypochondrium and left iliac fossa. Cystoscopy revealed an irregular raw mass protruding from the left ureteral orifice, to which blood clots were clinging. Chromocystoscopy disclosed exclusion of the left kidney, as did urography. Attempts to catheterize the left ureteral meatus failed.

At operation, through a left oblique iliac extravesical incision, the lower portion of the ureter was exposed and palpated; a hazelnut-sized nodule was perceived at the level of the iliopelvic union. The ureter was transsected at the level of its junction with the bladder; then, through the usual lumbar incision the entire hydronephrotic kidney and ureter were removed. Postoperative healing was without incident.

The histologic examination of the removed specimen disclosed the presence of a papillary epithelioma at the level of the middle third of the ureter with frank invasion of the muscular and adventitial layers.

The second patient was a 62 year old male who, 6 weeks previously, had suffered an attack of hematuria, almost continuous, with small clots of blood in the urine. Examination of the urine by the method of Papanicolaou disclosed abundant cellular elements with huge atypical nuclei (Papanicolaou type II—positive). Again in this patient chromocystoscopy revealed exclusion of the left kidney and the left ureter could not be catheterized.

At operation, through a midline infraumbilical, extraperitoneal incision and approach to the lower

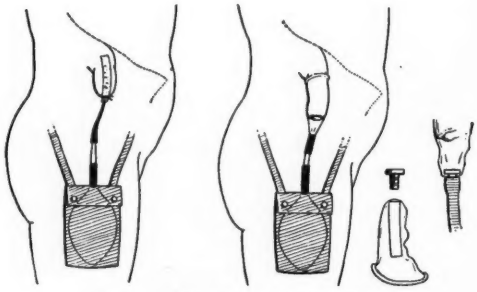


Fig. 1 (Thiermann). Ureterpenis.

portion of the ureter in its extreme terminal portion, a firm nodule the size of a lentil was palpated. The usual lumbar approach to the kidney was carried out and the entire kidney and ureter were removed en bloc. Examination of the removed specimen revealed a pea-sized sessile tumor, located about 3 cm. from the meatus. Histopathologic study disclosed the presence of a papillary epithelioma with invasion of the muscular layers up to the outermost layers which it had not yet penetrated.

These two quite analogous instances of primitive tumor of the ureter were both observed within a relatively short time of one another which permits them to be recorded together with their principal symptoms and operative findings. Thus, the reader may readily see their similarities and dissimilarities, in view of the modern concepts of these rare neoplasms. —*John W. Brennan, M.D.*

The Ureterpenis (Der Ureterpenis). EDMUND THIERMANN. *Zschr. Urol.*, 1954, 47: 118.

IMPLANTATION OF THE URETER in the skin has not been too popular because it has been difficult to maintain a well functioning ureteral orifice that could be cared for easily. Much of the difficulty connected with the care of a ureterocutaneous fistula, however, can be avoided by implanting the ureter into a so-called "ureterpenis," which consists of a full thickness tubular skin graft. In the past this sort of structure has been formed in the lower abdominal quadrant but this is an unfavorable position. The ureter which has to be brought through the aponeurosis of the abdominal wall is easily compressed which factor leads to sloughing and retraction of the ureteral orifice.

To have the ureter emerge from a point in the midaxillary line just ahead of the tip of the last rib in an area where there is very little aponeurosis appears to the author to be a much favored location. A long cylindrical graft is first prepared according to the method of Bunnell (*Surgery of the Hand*, Philadelphia: J. B. Lippincott Co., 1944). The posterior part of this graft is hinged at the area where the ureter is to be brought out through the abdominal wall. Ten to 12 days after the establishment of this graft, the ureter is freed and imbedded into the penis-shaped graft. Five to 7 cm. of the eleventh rib are resected to gain access to the ureter (Fig. 1). The "ureterpenis" is tunneled along its length by means of a trocar. The sheath of the trocar is then allowed to remain in place, and the ureter is intubated with a size 10 or 12 ureteral catheter and brought through the sheath of the trocar. A good portion of the ureter should protrude beyond the "ureterpenis." The ureter is fixed to the end of the tubular graft by means of a couple of loosely tied interrupted sutures. If the ureter is cut off flush with the graft, stricture of the ureteral orifice will result.

Urine is collected either by means of a catheter which is passed into the ureter and allowed to drain in a rubber urinal, or, when this is not necessary, a condom can be slipped over the "ureterpenis" and connected with the rubber urinal. The advantages of a "ureterpenis" are obvious. The patient is able to keep himself clean and dry with ease. The receptacle for the collection of urine can be attached by means of a belt-like arrangement or it can be suspended from the shoulder. —*S. Richard Muellner, M.D.*

BLADDER, URETHRA, AND PENIS

Vesical Neck Obstruction in the Female; Its Etiology and Treatment. ERNEST F. HOCK. *J. Urol.*, Balt., 1954, 72: 657.

FOUR POSSIBILITIES are suggested to explain urinary retention in females: (1) tissue protruding into the urethral lumen, (2) rigidity of the vesical neck, (3) excessive angulation at the urethrovesical junction, and (4) functional imbalance between forces of expulsion and of retention.

Transurethral resection of the vesical neck is conceded to be the most effective single procedure for the relief of urinary retention in females, but approximately 18 per cent of the patients so treated were not relieved despite multiple resections.

Transurethral resection seems to be most effective in cases with protruding tissue or weakness of forces of expulsion. Results were poor when this method was employed in instances of excessive angulation and spasm of the muscles of the pelvic floor, and equivocal when there was rigidity of the vesical neck. However, it is still recommended when the etiology of the obstruction remains uncertain.

Cystocele repair is advised when there is abnormal angulation at the vesical neck or in the midurethra. A surgical technique is outlined for cases in which such angulation is found without a demonstrable cystocele and for those patients who are not relieved by transurethral resection.

This procedure consists of freeing the posterior and lateral walls of the proximal urethra and vesical neck through a midline vertical incision in the anterior vaginal wall. The pubovesical fascia is excised, left retracted, or closed transversely. Ability to express fluid through the intact urethra by manual abdominal pressure is the index for the amount of freeing that may be necessary. The vagina is packed for one day and a catheter is left in the urethra for 3 to 5 days. This operation is illustrated by drawings and 3 exemplary cases. One of these patients developed an obstructive bar at the vesical neck after operation. This was attributed to the derangement of the pubovesical fascia and was relieved by transurethral resection.

The basis for this study was an analysis of 36 female patients who underwent transurethral resection during an 8 year period ending in 1953. Histopathologic study of the tissue which was removed failed to clarify the causes of obstruction,—*Ormond S. Culp, M.D.*

The Surgery of Hypospadias (Zur Operation der Hypospadie). EDMUND THIERMANN. *Zschr. Urol.*, 1954, 47: 242.

THE PRESENT procedure is accomplished in 2 sessions and is done quite early in life (at the age of 4 or 5 years). The first part of the operation consists in forming an epithelial-lined urethral canal from the summit of the glans penis in front, to back near the hypospadic opening. This is accomplished by unfolding the prepuce, sewing its two sides together over a catheter to form a tube, and drawing this tube through the newly made closed channel, through the glans and anterior portion of the corpus penis (Fig. 1).

When this plastic preputial tube has healed in place, the second phase of the operation is begun, i.e., the technique of closing the breach between the posterior end of the preputial plastic channel and the hypospadic opening. Three different operative procedures are adopted, depending upon the position of the hypospadic opening.

For the penile type of hypospadias, the old method recommended by Duplay in 1874 is used. This method was later modified by Marion and has recently been taken up again by Denis Browne (Hypospadias; Techniques in British Surgery. 412–418. London: Saunders, 1950). It is based on the well known fact that if a strip of epithelial tissue is buried in the subcutaneous tissues, the epithelial surface will not penetrate the surrounding connective tissue but will form a completely closed channel lined entirely by epithelium. The tract between the above mentioned two openings is simply covered over by the raw surfaces of flaps taken from the penile shaft. No retention catheter is used. In the older child the urine is drained, during the healing period, through a perineal incision; in the younger child and especially for the scrotal (perineal) type of hypospadias, a suprapubic cystostomy is preferred. The odd form of skin closure—which goes back to the time of Duplay—is illustrated in the original text.

When the hypospadic aperture is located at the penoscrotal angle the preputial condition is managed as has been described; however, the posterior phase differs from that described for the penile hypospadias in that the urethral tract between the two apertures is closed over a catheter into a complete epithelial canal and the penis is then bent down and stitched to the sides of an incision in the scrotum. The closure of the raw surfaces of these two structures is then done in a similar manner to that mentioned in the discussion of the penile hypospadias.

When the hypospadic aperture is located far back near, or at, the perineum, the epithelial tract between the two apertures (above described) is treated as in the first work on the penoscrotal type of hypospadias until use of the scrotal tissue is necessary; then, however, the penis is not simply bent downwards and the skin borders united, but the scrotum is widely opened and its loose subcutaneous tissues

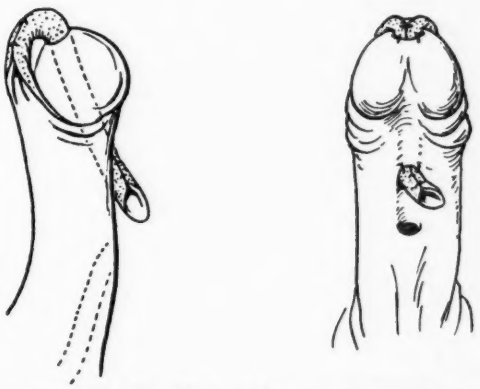


FIG. 1 (Thiermann). *Left*, The preputial urethra has been drawn into the newly formed canal, its proximal termination protruding in the semblance of the so-called Pope's nose of the chicken's tail appendage. *Right*, Fixation of the preputial urethra above and below by means of a few stitches.

are brought up in large amounts, burying deeply the newly formed urethral canal, and the skin (scrotal flaps) closed over the whole; thus an extra session for detachment from the scrotum will not be necessary.

A number of photographs show the excellent results which have been obtained. Unfortunately, however, the author is not able to present figures, since most of his experience has been gained under conditions of military surgery and such material is generally not traceable.

The author does not agree with writers (DAVIS, *J. Urol.*, 1951, 65: 595), who favor reducing the entire procedure to one operation. In his opinion, the most important objective from the standpoint of the patient is that of obtaining good healing and satisfactory functional results. These considerations certainly outweigh any advantage to be expected from shortening the operative procedure. *John W. Brennan, M.D.*

GENITAL ORGANS

The Sclerosing Treatment of Prostatic Hypertrophy (La thérapeutique sclérosante de l'hypertrophie prostatique). MARIO NEGRO. *J. urol. méd.*, Par., 1954, 60: 3.

SINCE SPRING OF 1951 the author has been getting positive results with his method of injecting a sclerosing fluid (oleate of aminoglycerine, 6 per cent solution, 0.35 gm.; ethyl alcohol, 0.035 gm.; sulfadiazine, 0.083 gm.; sulfamethazine, 0.083; aminoglycerine, 0.40 gm.) into the hypertrophic tissues of the prostatic gland. The injections have been made through the urethroscope, with a rather rigid (plastic), specially manufactured ureteral catheter with a needle at one end and a socket for an ordinary injection syringe at the other.

Since the afore-mentioned date of positive results the author has treated 122 hypertrophied prostates.

Of these, 118 were treated with a closed bladder through the urethroscope; 4 were treated through a suprapubic cystostomy.

Of the patients so treated, the great majority, if not all, have experienced a return of vesical function in step with the reduction in volume of the adenoma or with its total disappearance.

In some instances, it is true, rectal examination has disclosed a persistence of the adenoma while the patient claims that he is urinating perfectly and the residual urine is absent or almost so. This results from the fact that the injection therapy has destroyed the portion of the adenoma which is designated as the vesical portion, while the deep rectal portion has not been affected. Vice versa, in some instances the patient continues to urinate with difficulty while the examining finger in the rectum indicates disappearance of the adenoma. In these instances the injections have involved the deep portion toward the rectum, while the portion toward the bladder has not been affected, and more injections are necessary.

Some of these cases date back for more than 2.5 years with continuing excellent health and perfect bladder functioning. Most of the recurrences of the trouble have been in patients who, having received a partial amelioration of their condition with the first or second injection, have dropped the treatment and have not reappeared until return of the condition of prostatism.

However, the author does not mean to suggest that the method is a substitute for surgery of the hypertrophic prostate. Like all the therapies, precise indications are required. One cannot claim more for the method than it is qualified to produce. The treatment is purely urologic and should be practiced only by the urologist who is skilled with the use of the instruments of urethrocystoscopy.

Four case histories are appended (3 without suprapubic cystostomy, and 1 with this procedure); however, they are not intended to be used for statistical purposes but merely to render more graphic the readers' impressions of the method. The results in these 4 instances are all analogous to those discussed in a general sense above.

—*John W. Brennan, M.D.*

Carcinoma of the Prostate in Jews and Circumcised Gentiles. E. C. Gibson. *Brit. J. Urol.*, 1954, 26: 227.

Ravich and Ravich, analyzing 1,407 cases of prostatic obstruction, found an incidence of 1.8 per cent of cancer of the prostate in Jews as compared to 1.9 per cent in gentiles. These figures suggested to them a definite relationship between the ritual circumcision and the eventual malignant degeneration of the prostate.

Three possibilities may explain these amazing statistics: (1) racial immunity, (2) national customs (strict laws being laid down in Leviticus regarding genital hygiene, which orthodox Jews must obey), and (3) the incidence of carcinoma of the prostate in Ravich's patients may not really be low but only appear to be so because the true incidence of benign hypertrophy in this group was so high.

To evaluate the significance of Ravich and Ravich's figures, the author subjected to careful statistical analysis a series of 105 cases of his own. He found he could not corroborate Ravich's conclusions. The incidence of carcinoma of the prostate in Jews circumcised in infancy does not seem to be lower in the author's cases when compared to that in gentiles. Circumcision in infancy as a preventative of cancer of the prostate in later life, therefore, is not advised on the basis of this study.

—*S. Richard Muellner, M.D.*

The Metastasis of Cancer of the Prostate (Las metastasis del cancer de prostata). J. Picatoste y Picatoste. *Cir. gin. urol.*, 1954, 7: 47.

Four instances of metastasis of prostatic carcinoma are reported. All of the patients were treated by follicular hormone—not the natural follicular hormone but its artificial analogue, stilbestrol—with spectacular results in most of the patients. A series of roentgenographic reproductions depict the characteristics of the skeletal metastases in 2 of these patients; however, these roentgenograms must be consulted in the original text. Two of the figures depict the degree of blackening of the lumbar vertebra and pelvic girdle before and after 3 months of intense estrogenic treatment.

The first patient was a 62 year old man with prostatic cancer who had been suffering for 2 years with severe pain in the two lower extremities in the sacrolumbar region and in the region of the inguinal glands. At examination originally the prostate was not much enlarged but contained in each lateral lobe a lump of woody firmness. The inguinal glands on both sides—particularly on the left—were the size of hazelnuts and of semisoft (doughy) consistency. Histologic diagnosis of a gland removed at biopsy was that of carcinomatous metastasis.

After 3 months of treatment with the estrogen the blackening of the skeletal roentgenogram had lightened markedly, the ulcer remaining from a previous biopsy had healed, and the inguinal glands had diminished to the size of peas; the pains were largely relieved and the patient had recovered his appetite and regained weight. After 2 years the inguinal glands were barely perceptible, the pains had disappeared entirely, the patient could walk without a cane and had returned to his ordinary way of living, and had become obese.

The second patient was a 72 year old man with prostatic cancer who had been suffering for 2 years from diurnal and nocturnal polyuria and difficulty in urination. Three months before the examination he had been operated upon for a lump on the face—tumor of the ascending ramus of the inferior maxilla—with the histologic diagnosis of carcinoma, consisting of poorly differentiated epithelial cancer cells.

At examination the prostate was found to be large, firm, and of irregular consistency. Estrogens were given and an inlying catheter was inserted. The family decided to take the patient home and have the injections given there. The patient lived for slightly more than a month thereafter.

The third patient was a 55 year old man with prostatic cancer who had been treated in the United States by antirheumatic preparations for a possible sacroiliac arthritis and a discrete spondylarthrosis. (The present report was from northern Spain.)

Examination revealed an enlarged prostate, firmly fixed and of extraordinarily hard, irregular consistency. There were a number of bean-sized nodules in the palms of both hands in the subcutaneous tissues, adherent to both the skin above and the aponeurosis below.

The results of treatment with estrogens could be qualified with the term "spectacular"; after 2 months the palmar nodules had disappeared, the pains had regressed, and the patient had gained 4 kgm. in weight. After a year the patient had gained 12 kgm. in body weight and was able to return to normal life. After 2 years of normal living the symptoms began to return, and the patient died, after 2 years and 3 months of carcinomatous cachexia.

The fourth patient was a 75 year old man with prostatic cancer who had been given a diagnosis in the cardiological department of neoplastic metastasis in the posterior region of the upper right lung field. The prostate was small but exhibited an extraordinarily hard nodule in the right lobe. Under estrogen treatment the prostatic nodule lost its hardness and the general condition of the patient improved; however, the pulmonary metastasis continued to increase in size—acting more like a bronchial neoplasm. According to information received, the patient died a few months later.

In reporting these instances of marked improvement with prolonged survival under treatment with estrogens, the author does not intend to be understood as refuting castration nor the possibility of benefits to be derived by the new treatment of adrenalectomy combined with cortisone therapy. He has had no occasion to use the former method, and has had no personal experience with the latter.

—John W. Brennan, M.D.

MISCELLANEOUS

The Treatment of Stress Incontinence in Women with Dondren; Report on a New Injection Technique (Die Behandlung der relativen Inkontinenz bei Frauen mit Dondren; Mitteilung einer neuen Injektionstechnik). H. FRIELING. *Zschr. Urol.*, 1954, 47: 94.

Urinary incontinence is present in 15 to 20 per cent of the women seen by the gynecologist. Many operations have been devised for the cure of this condition, and attempts have been made to relieve it by injecting various substances in and about the internal sphincter. Seventy-one women were treated for urinary stress incontinence by means of a new sclerosing solution which was prepared for the author. It is a mineral oil type of sclerosing solution which is marketed under the name of "dondren."

In his early cases, the author injected through the anterior vaginal wall 1 c.c. of "dondren" on either side of the urethra at the level of the internal sphincter. The injection is practically painless and is said to produce scar tissue locally. If the first injection is not successful it may be repeated within 5 to 8 days. In most instances only 2 to 3 injections were necessary for a successful result.

More recently, however, the author has modified his injection technique by employing general anesthesia (peridural or evipan) and injecting the "dondren" by means of a needle passed through the cystoscope at 5 and 8 o'clock in the posterior margins of the internal sphincter. By visualizing the site of injection, more satisfactory results were obtained after a single injection and edema or necrosis in the region of the internal sphincter was avoided. The new method is preferred to the blind technique of injection through the anterior vaginal wall.

Ninety per cent of 71 women treated in this manner are reported to be "cured" of their incontinence. Ten per cent were benefited, but not cured. The longest follow-up period thus far has been only half a year.

—S. Richard Muellner, M.D.

The Treatment of Urogenital Tuberculosis (Die Behandlung der Urogenitaltuberkulose). EINAR LJUNGGREN. *Zschr. Urol.*, 1954, 47: 273.

THIS REPORT is based upon the treatment of 148 patients at the Rävlanda Sanatorium between 1948 and 1950. Chemotherapy preceded the operations and was continued following the surgery until 5 guinea pig tests at 4 to 6 week intervals remained negative.

Improved wound healing, and a decrease of mortality and morbidity (epididymitis) were observed in comparison with the experience at the Stockholm clinics. The success of partial nephrectomy on 10 patients with resulting negative guinea pig tests was outstanding.

Forty-six cases consisted of patients with unilateral, nonoperatively treated renal tuberculosis, with tuberculosis of the solitary kidney, and with bilateral renal tuberculosis, all of which were treated conservatively. Some of these patients had previously undergone unilateral or partial nephrectomy. Bladder complaints disappeared completely (there were no contracted bladders in this group). Only in 10 patients was the guinea pig test positive; in the remaining 36 patients, 5 guinea pig tests, at 4 to 6 week intervals, proved negative. The treatment period was long, up to 4 years in 1 patient. Roentgenologically, no progression was found during chemotherapy; in some instances there was healing while in others no change was seen. This is consistent with the improvement observed pathologicoanatomically by Hild Hansson.

In cases of contracted bladder which threatens the upper urinary tract, cutaneous ureterostomy with a skin-cuff is preferred to ureterointestinal anastomosis.

In cases of genital tuberculosis, the guinea pig test of the sperm may be diagnostically important when the urine test remains negative. Prostatic tuberculosis and that of the spermatic vesicles resists chemotherapy, and even 5 negative guinea pig tests may, after a longer interval, be followed by a positive one. Epididymitis is not hematogenous but develops by continuity through the vas deferens. Four cases of epididymitis developed after discontinuation of chemotherapy. Prophylactic vasoresection prevented epididymitis in 20 cases. Analysis of the sperm and the age of the patient were considered in the indication. The resistance of the tubercle bacilli to chemotherapy was negligible.

All patients, be they prospective candidates for surgery or not, are treated initially with para-aminosalicylic acid (PAS) and dihydrostreptomycin;

2 gm. of the former are given 5 times a day, and 1 gm. of dihydrostreptomycin is given every other day; 0.05 gm. of conteben is given twice a day to replace PAS if this is not tolerated. If no satisfactory result is achieved within 6 months, isoniazid 0.3 gm. per day is combined with either dihydrostreptomycin and/or PAS. After 1 year, chemotherapy is substituted for 1 to 2 months with vitamin D_2 and calcium if the urine is still positive for tubercle bacilli; thereafter, chemotherapy is again resumed. Urographic and bacteriologic examinations are done at regular intervals; cystoscopy is done when indicated.

Parenchymatous tuberculosis and unilateral small ulcers with involvement of one or two papillae are treated conservatively provided that the urine becomes negative; if this fails, partial nephrectomy becomes indicated. For all other cases nephrectomy is done. Nephrectomy and ureterectomy is the method of choice if there is roentgenologic evidence of ureteric involvement. In favorable lesions, bilateral partial nephrectomy is practiced. Nephrectomy is done if the remaining kidney functions well; otherwise, conservative treatment is indicated.

Cutaneous cuff ureterostomy is done in cases of contracted bladder with dilatation of the upper urinary tract; if no dilatation is present, Scheele's ring plasty with the small intestine is performed.

Epididymitis is treated by ectomy of the epididymis and resection or removal of the testis according to the extent of the lesion. Fibrotic lesions are treated conservatively. Vasectomy and spermatocystectomy are done as indicated, but not prostatectomy.

Prostatic and vesicular tuberculosis are treated conservatively, but occasionally a prophylactic vasoresection is performed.

All interventions are preceded by chemotherapy for a 2 months' period. Six months of chemotherapy prepare the patient for partial nephrectomy. Chemotherapy is discontinued when 5 guinea pig tests remain negative, and the patient is discharged from the sanatorium after 2 further guinea pig tests remain negative following discontinuation of the chemotherapy. The patient may remain under conservative therapy in the sanatorium for 2 or more years. An exception is made in cases of symptomless genital tuberculosis in which he may be returned to work despite positive guinea pig tests. He then receives intermittent chemotherapy, 8 weeks twice yearly. After discharge, follow-up examinations are done every second month, later at longer intervals, and eventually once a year.

—*Ernest Bors, M.D.*

Cystic Lymphangioma: An Uncommon Type of Scrotal Swelling. GORDON FERGUSON. *Brit. J. Urol.*, 1954, 26: 264.

CYSTIC LYMPHANGIOMA of the scrotum is a rare form of scrotal swelling. Only 7 such cases were reported in the literature in the past. This case report deals with a 2.5 year old boy who suffered pain in the left side of the scrotum, of a few hours' duration. The pain had come on suddenly and was severe. The left side of the scrotum was found to be enlarged, tender, red, and edematous and an irregular cystic mass was found to be adherent to the base of the scrotum. The testis and epididymis could be separated from the mass.

At exploration the swelling proved to be a multicystic mass closely adherent to the scrotal wall. Some of the cysts contained pale yellow fluid and others were filled with fresh blood and blood clot. The histologic findings were consistent with a cystic lymphangioma of the scrotum. The rupture of the cysts is said to be the cause of the sudden pain in these cases.

—*S. Richard Muellner, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Multiple and Congenital Mesenchymomatosis with Osteocutaneous Lesions (Mesenquimomatosis multiple y congenita con lesiones osteocutaneas). F. SCHAJOWICZ, D. FUKS, and R. LAPILOVER. *Rev. ortop. traumat.*, 1953, 23: 28.

IT WAS NOTED at the normal birth of this 3,500 gm. girl child that there was a pea-sized nodule in the frontal region. In the course of the following 20 days there developed a series of nodules throughout the body and in the tongue. The nodules were all firm, of a more or less cartilaginous consistency; some grew to be as large as a hazelnut before beginning to regress. During this period the roentgenologic examination showed quite large shadow defects in the bones; these formed more or less rounded holes in the bone shadows, without any evidence of osteogenesis. There was one defect in the temporal region of the skull and one in the upper jaw; otherwise involvement was exclusively of the metaphyseal regions of the long bones (the epiphyses were not involved). In some cases these nodules elevated the skin and in others the skin over the lump was reddened and exhibited a tracery of veins; however, they were only adherent to the deeper fascial planes, the skin being movable above them. There were no evidences of skin lesions of a verrucous character, as in von Recklinghausen's disease.

Biopsy specimens were procured from a lump in front of the sternum and from the upper metaphysis of the right tibia; this latter specimen was ample and included areas of the surrounding normal bone. Histologic examination of these specimens disclosed a mixture of fibromatous tissues with what appeared to be muscle fibers. In the central portion were zones of a chondroid substance; also, in the medullary cavity of the bone specimen the authors encountered cells which were evidently of a fibroleiomyomatous nature, i.e., they were evidently newly formed, not simply degenerating fibers already present; in fact, the entire picture suggested the results of a mesenchymatous pluripotentiality. There were a few nerve fibers present, and it is believed that these may have been present originally; nowhere was there any evidence of the development of the lemmocytes of Del Rio Hortega, elements which, according to these authors, are essential for the diagnosis of von Recklinghausen's disease.

Another factor against the presence of von Recklinghausen's neurofibromatosis was the surprising manner in which the lesions regressed spontaneously; 6 months after birth the nodules had diminished in size to the extent that they could hardly be felt; a year after birth they had completely disappeared, and the bone defects had been completely repaired.

Lack of involvement of the epiphyses would also seem to rule out the possibility of Ollier's multiple enchondrosis, and the same consideration would seem to rule out the possibility of the presence in this patient of the Hand-Schueller-Christian complex if, indeed, they are divergent manifestations of the same disease.

The only other condition which might be considered in the differential diagnosis is perhaps Lichtenstein and Jaffe's dysplasia fibrosa polyostotica. One of the authors of this article (Schajowicz), in a recent visit to New York, showed the slides of this patient to Jaffe and he admits that it is not Lichtenstein and Jaffe's, disease, nor von Recklinghausen's disease. The findings are much like the histologic findings in some solitary bone lesions which Jaffe has not yet published. For this condition, Jaffe suggested the designation of multiple congenital mesenchymomatosis, a designation which has been adopted by the present authors.

The only other similar cases which the authors have been able to find in the literature were those of Holt and Wright (*Radiology*, 1948); however, these authors evidently do not agree with Del Rio Hortega with reference to the criteria for the diagnosis of this condition and designate it as von Recklinghausen's disease. —*John W. Brennan, M.D.*

Osteogenic Fibroma of Bone; a Report of 2 Cases. J. S. R. GOLDING and H. A. SISSONS. *J. Bone Surg.*, 1954, 36-B: 428.

IN A SURVEY of bone lesions in which a diagnosis of osteoid osteoma had been suggested, the authors found 2 very similar cases which on careful review warranted the diagnosis of osteogenic fibroma of bone. In each case the symptom was paraplegia from cord compression by an expanding lesion originating in the region of the vertebral lamina; the lesions themselves caused little pain. Permanent recovery followed local excision of the tumors, although in each case radiotherapy was instituted on the erroneous supposition that the lesion was malignant. Histologic study revealed a mixture of osteoid tissue, irregularly calcified nonlamellar bone, and cellular fibrous tissue.

The lesions closely resemble Lichtenstein's description of "osteogenic" fibroma of bone," in that they occurred at about the age of puberty and were present in the spine, appearing roentgenologically as circumscribed areas of rarefaction with scattered calcification. Although benign, they may grow rapidly and produce a bulky lesion. The progressive increase in size of the lesions and the histologic appearance clearly established that they were neoplastic, and the clinical follow-up, despite something less than radical excision, and a relatively small dosage of deep x-ray therapy indicated that the tumors were benign. Diagnosis was difficult for the tumors were cellular and osteoblastic, and suggested osteogenic carcinoma except for lack of evidence of mitoses or irregular cytological features. The diagnosis of osteoclastoma was entertained because of the presence of osteoclasts. These cases differed from osteoid osteoma in that the lesion was not painful, was larger, and grew more rapidly than would be expected

of an osteoid osteoma. These features plus absence of sclerosis surrounding a nidus refuted the diagnosis of osteoid osteoma, although pathologically the tissue components were the same, namely, osteoid tissue and nonlamellar bone, osteoblasts and osteoclasts, and vascular fibrous tissue, but the proportions of each and their range were different.

—*Norman J. Rosenberg, M.D.*

Acute Suppurative Arthritis of the Hip in Premature Infants. DONALD W. ROSE. *J. Am. M. Ass.*, 1954, 156: 303.

THE AUTHOR REVIEWS all of the cases of acute suppurative arthritis of the hip in newborn infants in the King's County Hospital Center, Brooklyn, New York. Of 18 cases, 5 were unrecognized for a considerable period of time and in each instance the delay in diagnosis occurred in a premature infant. The average age at the onset of symptoms was 12 days. The first clinical signs recorded in 4 of the 5 cases were swelling of the buttock or thigh, or both. A high temperature was present in only 2 patients.

Treatment was usually delayed because of failure to make the diagnosis, and serious permanent damage resulted. The condition may be difficult to diagnose because of minimal systemic reaction, and roentgenographic changes appear too late. The diagnosis must be established by early detection of physical signs and immediate aspiration of the hip joint.

—*Norman J. Rosenberg, M.D.*

Approach to the Hip; a Suggested Improvement on Kocher's Method. BRYAN MCFARLAND and GEOFFREY OSBORNE. *J. Bone Surg.*, 1954, 36-B: 364.

THE AUTHORS describe a refinement of Kocher's approach to the hip joint. The approach is essentially lateral although the skin incision is centered over the greater trochanter, the tendinous junction of the gluteus maximus and tensor fascia lata above, and the middle of the shaft of the femur below. The gluteal fascia and iliotibial band are exposed and divided in the straight midlateral line along the whole length of the incision. The gluteus maximus is retracted posteriorly and the tensor fascia lata anteriorly. The gluteus medius is exposed and separated from the pyriformis and gluteus minimus deeply by blunt dissection. The gluteus medius and vastus lateralis are regarded as being in direct functional continuity through the periosteum of the greater trochanter. The junction of these muscles forms an angle which is open anteriorly, so that by loosening the periosteum from the trochanter it is possible to displace forward the combined muscle bellies like a bucket handle. Some times it is necessary to take some small portion of the cortex of the trochanter so that a few thin flakes of bone adhere to the tendon. This must be done with a scalpel or sharp chisel, and the whole combined muscle mass, including the gluteus medius and vastus lateralis with their tendinous junction, is then displaced forward. Sometimes it is necessary to detach a small part of the vastus lateralis arising from the intertrochanteric line and also to divide any anterior attachment that the gluteus medius may have to the gluteus minimus. The rest of the operation is similar to any other posterolateral approach: the tendon of the gluteus medius is retracted upward to expose the capsule of the hip joint. Bleeding may occur from the ascending branch of the medial circumflex artery behind the greater trochanter or from the transverse branch of the lateral femoral circumflex artery deep to the vastus lateralis. Closure is carried out in layers of which the gluteus minimus and capsule is usually the deepest; the gluteus medius and vastus lateralis are restored to their proper relation with the greater trochanter and the tendinous part is sutured to the undisturbed portion of the vastus lateralis and to the deep insertion of the gluteus maximus as well as to the upper portion of the quadratus femoris. The authors think that leaving the tendinous portion of the gluteus medius and vastus lateralis intact on the greater trochanter contributes to early restoration of function.

—*Norman J. Rosenberg, M.D.*

Congenital Pseudarthrosis of the Tibia (Della pseudoartrosi congenita della tibia). C. PAIS. *Chir. org. movim.*, 1953, 39: 259.

FOURTEEN PATIENTS with pseudarthrosis were operated upon during the past 5 years by the author's own personal technique. Of this group 10 (72 per cent) are cured and 4 have remained pseudarthrotic. All these patients were rather young; the author does not believe in waiting until puberty before he operates. His successful results were all obtained in patients from 2 to 4 years of age.

The author's operation consists in a combination of the insertion of an intramedullary nail of Delitala, using free osteoperiosteal grafts, retained by encircling catgut sutures, the application of two (lateral and medial) massive grafts of the onlay variety, and the fibula pro-tibia technique of Hahn. The author believes that the nail of Delitala offers the advantage of getting the limb to weight-bearing capacity sooner than could be done without its use, and thus contributes to any advantage to be expected from such stimulation of the healing processes; the same may be said of getting rid of the rigid resistance of the intact fibula (Hahn technique). The Hahn technique is, in the author's opinion, also indicated for the simple reason that it has been so successful in its own right, and it is included in this operation on the consideration that every bit of help is needed in the treatment of this difficult and stubborn condition.

The operation is done in four sessions. In the first phase, the stumps of the pseudarthrosis are skeletonized and the nail of Delitala is driven solidly into the proximal fragment and rather loosely inserted into the distal fragment. In the second session the head of the fibula and of the tibia are skeletonized sufficiently to osteotomize the upper part of the fibula and insert the distal fragment into a notch made in the apposing surface of the upper end of the tibia. This session ends with impulsion on the heel of sufficient force to drive the nail into the lower pseudarthrotic fragment to the point where the gap in the two pseudarthrotic fragments is closed, and to firmly fix the upper end of the tibia in its notch.

The third step consists in procuring the osteoperiosteal transplants from the healthy tibia and doing the osteosynthesis therewith. Finally, the fourth intervention osteotomizes the lower end of the fibula and in-

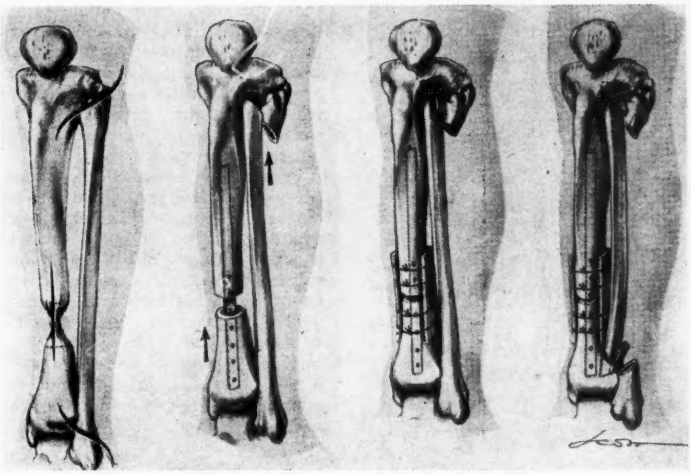


FIG. 1 (Pais). The fibula pro-tibia technique of Hahn.

fixes it in the lower end of the tibia as in the Hahn procedure (Fig. 1).

Following this operation the limb is put up in a plaster cast for about 6 months. Weight bearing is striven for by the end of the first postoperative month. Finally, in accordance with the age and development of the patient and the condition of the healing processes as revealed by the roentgenogram, an orthopedic support is worn by the patient for a further period of 2 to 3 years.

Amputation and the permanent use of a prosthesis were frequently encountered in former years, but today, fortunately, they are exceptional. However, although the present day procedures are promising in results, the mistake must not be made of considering the chapter of the treatment of congenital pseudarthrosis of the tibia as a closed one; every treatment so far devised has resulted in some failures.

—*John W. Brennan, M.D.*

Observations on the Origin and Etiology of the Clubfoot. EMIL D. W. HAUSER. *Q. Bull. Northwest. Univ. M. School.*, 1954, 28: 294.

THERE ARE two types of congenital clubfoot. The first is the typical talipes equinovarus with cavus which is the result of the retention of an abnormal position in utero. This deformity is usually bilateral. It varies in the degree of severity depending on how early the abnormal position becomes fixed. All structures are present but the relationship of the segments of the foot are altered. There is a muscle imbalance. The invertors are shortened and the evertors are lengthened and weakened. The first type is amenable to treatment and can be converted into a normal foot.

The second type is a true anomaly. There is a congenital disturbance in the primordium. Therefore, there is a defect or absence of structure. This type is more often unilateral. There is a strong hereditary and familial tendency. Six cases are reported which exemplify the anomalous type of clubfoot and demonstrate the author's treatment for this type.

The recognition of the two types is important clinically from the point of view of prognosis and treatment. The anomalous type has a poor prognosis and requires much greater persistence in treatment and more frequently requires surgical correction.

Talipes equinovarus is associated with a rotation of the tibia and internal rotation of the hip. The entire lower extremity is involved in the postural change. There is even some change in the epiphyses at the ankle joint. The structural alterations and the growth of bone act in accordance with Wolff's law. This can be considered a fortunate circumstance, inasmuch as Wolff's law applies to the correction of the deformity. A normal position with normal function will result in normal osseous development.

A familial occurrence of deformities is more frequent in the anomalous type of clubfoot than in the simple postural type—in other words, there is a greater risk of siblings with talipes equinovarus if one child has an anomalous type. There is also a greater hereditary factor for the anomalous group although there is evidence of some hereditary tendency for the functional type. The latter could be explained on the basis of an inheritance in deformity of the uterus of the mother.

It is important to determine the type of clubfoot from the point of view of the prognosis as well as that of treatment. The differentiation of the two types is not easy, particularly in the early stages. Cases with total loss of structure and with constrictions are evidently of the second type. Only after the foot has been corrected so that normal function can be assumed can one distinguish with any degree of certainty whether there is a true paralysis or failure of function due to a previous fixed abnormal position. This type of case obviously has a poor prognosis and offers more difficulty in treatment. The significance of the differen-

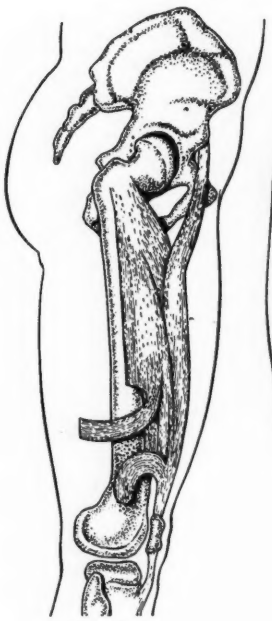


FIG. 1.

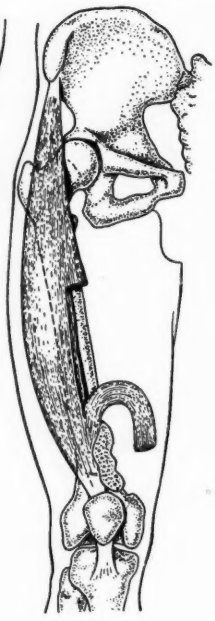


FIG. 2.

FIG. 1 (Ruehl). Filling of cavity in distal femur portion by two quadriceps muscle flaps.

FIG. 2. Scheme of a distal muscle flap in an osteomyelitic cavity near the joint.

tiation between the two types of congenital clubfoot is primarily one of prognosis.

—C. Fred Goeringer, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Application and Technique of Plastic Procedures in Osteomyelitic Bone Cavities (Anwendung und Technik plastischer Massnahmen bei osteomyelitischen Knochenhoehlen). R. RUEHL. *Chirurg*, 1954, 25: 273.

IN CONTRAST to acute osteomyelitis, the chronic form still requires a radical approach and complete removal of the inflamed cavities. The author does not subscribe to the method of some American authors who remove the sequestrum only, because he has found recurrences in 40 per cent of the cases. To fill the defect he uses a flap of muscle, a procedure which seems physiologically sound because of the vascularity, plasticity and elasticity, and minimum danger of necrosis of the flap.

This method was first published in 1895 by Schulten in Sweden, who carried out the procedure in two stages: excochleation and packing; and in 4 weeks, after the appearance of granulation tissue, muscle transplantation.

The author, who reported good results in 15 cases, used a tubed flap from the quadriceps for cavities in the upper or middle femur segment. Sometimes a proximal and distal muscle flap was used from the large quadriceps mass to fill out larger, distal femur cavities. This method is more physiologic than the use of a gastrocnemius flap. For some femur defects the long head of the biceps can also be used. Over the tibia, part of the anterior tibial or gastrocnemius muscle can be used.

Preliminary roentgenographic contrast controls are necessary to determine the extent and the size of the cavities. After excision of the sinus the whole cavity is explored and painstakingly cleaned. The oozing is checked with the aid of hot saline compresses. No sutures are necessary because the overlying skin exerts enough compression. A rubber drain is removed after 4 days. With splinting for 2 weeks the patients are able to leave the hospital after 3 weeks and to resume work in 5 weeks. Sometimes a second procedure is necessary if new foci appear. The method is considered simple and reliable, and it should not be long delayed because antibiotics alone may only check but not cure the condition.

—Ernest H. Bettman, M.D.

The Surgical Treatment of Clawhand in Leprosy (Le traitement chirurgical des griffes digitales de la lèpre). JEAN LAGRANGE and MICHEL VIETTE. *Sem. hôp. Par.*, 1954, 30: 2984.

THE MOST COMMON nerve lesion in leprosy is paralysis of the ulnar nerve. Paralysis of other nerves of the upper extremity is usually incomplete. Passive stretching of the joints previous to surgery can only be done manually, as splints often cause pressure sores in hands with deficient sensation.

In early cases the authors perform tendon transplants of the Bunnell type. The flexor sublimis of the index finger is transferred to the interosseus tendon at the radial side of the index finger; the flexor sublimis of the third finger is split and fixed to the medius and fourth finger; the flexor sublimis of the fifth finger is attached to the ulnar side of the fifth finger (the flexor sublimis of the fourth finger is saved for eventual use in opponens transfers). The tendon sutures are performed with separate silk sutures. Plaster immobilization following surgery is impossible because of the lack of sensation. Although hyperextension of the metacarpophalangeal joints was not always completely overcome, the procedure described was carried out in 5 cases with good functional results.

The Fowler type of tendon transplant which utilizes the split extensor indicis proprius and extensor digiti quinti, passing them in front of the transverse metacarpal ligament and attaching them at the lateral sides of the interosseus fibrous expansion, was also used. These transfers act as a tenodesis, limiting the extension of the first phalanx, but the extension force at the proximal interphalangeal joint is at first often insufficient after surgery and full extension may never be gained.

In older irreducible deformities, arthrodesis is the only efficient technique. The proximal interphalangeal joints are usually fixed; for the index finger the angle is 120 degrees, and for the third and fourth fingers the angle is 90 degrees.

—Joseph C. Mulier, M.D.

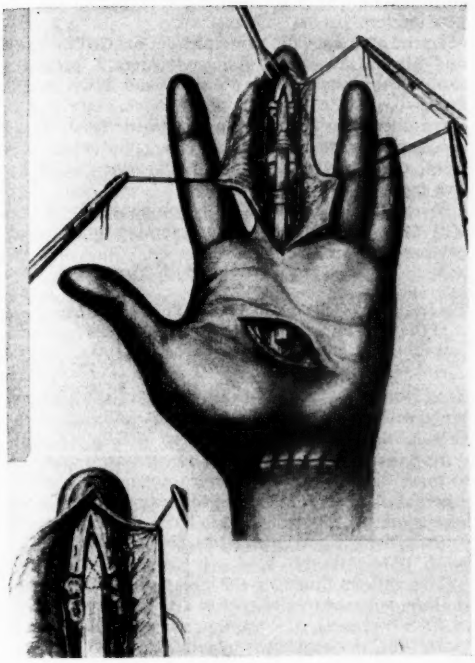
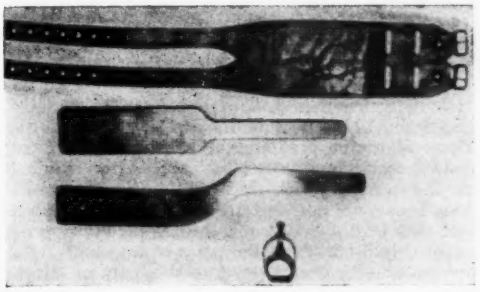
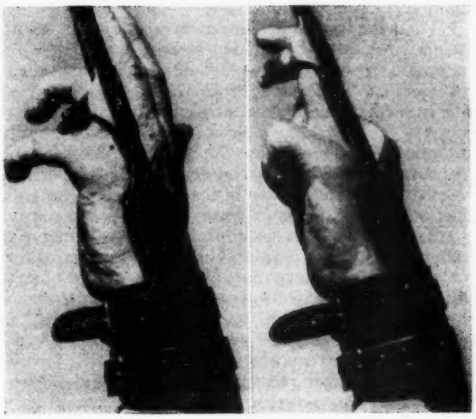


FIG. 1.

FIG. 1. (Hans May). Distal end of sublimis tendon is sacrificed; proximal end is drawn through palm. Inset shows method of suture of transplant to distal phalanx. Short distal stump of profundus is split and a tunnel is bored between the two leaves of the profundus through the distal phalanx to, but not through, the nail. A fine steel suture is introduced into the end of the graft according to the Bunnell "pull out" technique and the ends of this suture are pulled through the canal and nail by means of a straight needle and tied over a gauze roll over the nail (easily removed in 4 weeks). Sutures further anchor graft to profundus stump. Proximal annular ligament is replaced by a tendon graft (a piece of sublimis tendon or toe tendon). The graft is carried around the bone on a Dechamp's instrument.



a



b c

FIG. 2. a, b, c, Simple splint to promote flexion of middle and distal phalanges. In this case the profundus of the ring finger was replaced by a long extensor tendon of one of the toes. Active flexion without splint led to motion in metacarpophalangeal joint principally, while interphalangeal joint scarcely moved. By means of a movable ring it is possible to immobilize the proximal phalanx and thereby transfer the flexion power to the interphalangeal joints (as in b) or to hold the proximal and middle phalanges and thereby concentrate pull on the distal phalanx (as in c).

Surgery of Open Traumatic Tendon and Nerve Interruptions of the Hand, Inclusive of the Use of the Free Tendon Transplant (Chirurgie der offenen Sehnen- und Nervendurchtrennungen der Hand, einschliesslich Anwendung der freien Sehnentransplantation). HANS MAY. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 277: 599.

THE AUTHOR refers to the article by Koch and Mason (*Surgery, Gynecology & Obstetrics*, 1933, 56: 1) for the evaluation of the present status of surgery of open traumatic tendon and nerve interruptions of the hand, also with regard to general anesthesia and the bloodless field (tourniquet in the guise of the blood pressure cuff), and the inability of the modern chemotherapeutics and antibiotics to take the place of skillful and of clean surgery. He also points out the importance of preoperative neurologic study to determine the extent of the nerve injury. Like these two authorities in the matter of the surgery of the hand, he insists that the injured hand not be operated upon unless the surgeon is convinced that the wound will heal by first intention; it should first be surgically cleaned and then allowed to heal without any attempt to reunite the nerves or tendons. The previous authors insisted that immediate surgery, other than the surgical cleaning-up, should not be attempted after 2 hours from the time of injury, while the present author allows a slightly longer period of grace (about 8 hours).

If an attempt is made to reunite both the deep and the superficial flexor tendons in the palm, the lumbri-

calis muscle should be interposed between the two suture lines in order to prevent the growing together of the two tendons. The most frequent form of cut tendon is in the flexor region of the fingers at the level of the interdigital skin folds. At this level there are 3 tendons in the tendon sheath: the 2 crura of the tendon of the flexor digitorum sublimis and the tendon of the flexor digitorum profundus. When all three are cut, only the tendon of the profundus should be reunited. In the recent injuries—in which the tendons of the long flexors are not yet retracted—the proximal tendon may be drawn down, and when the injury is not more than 3 cm. from the point of attachment this tendon may be drawn down to the point of attachment itself and there fixed, so as to avoid having the suture line come to lie within the highly vulnerable tendon sheath.

When the wound is allowed to heal without an attempt to reunite the divided structures and then reoperated upon about 3 weeks later, when the absence of infection can be assured, the chief difference from the immediate methods of surgical procedure lies perhaps in the fact that a plastic procedure is frequently necessary. The materials which may be used for the substitute tendon are the tendon of the flexor digitorum sublimis, the tendon of the palmaris longus and, last but not least, the extensor tendons of the second to the fifth toes. This last enumerated plastic material has, in the author's opinion, the following advantages: (1) these tendons have more abundant sheaths of elastic supporting tissue (important for the nutrition of the substituted material); and (2) they are of smaller caliber (the smaller the transplant, the more rapid and certain the regeneration).

At the time of the secondary operation the tendons have, as a rule, retracted so far that the reuniting of the stumps is impossible; however, the profundus tendons are, as a rule, held at the middle of the palm by the attachments of the lumbricals. The long flexor of the thumb must usually be sought at the level of the wrist joint. The empty tendon sheaths are excised with the exception of a narrow proximal and distal annular ligament. If the annular ligament at the base of the basal phalanx must be removed, it must later be reconstructed, either by passing a fascial or ligamentous strip around the bone, or by reconstructing it from the residuum of the terminal crura of the sublimis tendon (Koch and Mason).

If the sublimis tendon is intact and only the profundus has been cut through, the author believes that it is better to fix the middle phalanx at an angle of 30 degrees, without interfering with the functioning of the sublimis (flexion of the basal phalanx on the metacarpal).

If the profundus must be replaced plastically, the sublimis is not sacrificed but fixed by its proximal stump to the profundus; its greater flexion capacity lends more power to the contraction of the profundus. The method of fixing the transplant to the terminal phalanx is that of Sumner Koch (encirclement of the phalanx by the transplant), or by the method of Sterling Bunnell which the author has modified (Fig. 1). The suture of the proximal end of the transplant to the stump of the profundus is carried out at the level of the attachments of the lumbricals, so that this muscle tissue may later be used to form a sheath for the new tendon.

In the after care the principles enunciated by Koch and Mason are strictly followed. After 3 weeks the supporting dressings are removed and active movements (with the hand in warm water) are begun. Physiotherapeutic methods are but little used. Fig. 2 *a, b, and c* depicts a form of exercising splint which may be of advantage to the patient in carrying out the active exercises.

When the tendon lesion is accompanied by lesions of the nerves, intensive passive exercises will forestall contracture in the antagonists.

—*John W. Brennan, M.D.*

Treatment and Results in Late Traumatic Luxations of the Hip Joint (Trattamento ed esiti della lussazione traumatica inveterata dell'anca). FRANCO ZAROTTI and BRUNO ALBERTINI. *Chir. org. movim.*, 1953, 39: 292.

FORTY-SEVEN instances of dislocation of the hip joint are discussed. These comprise the material at the Rissoli Institute of the University of Bologna, Italy during the years 1904 to 1948. The group is made up of those dislocations which were not reduced within a period of 20 days following the traumatic accident. The acute luxations of the hip were reported several years ago by Zarotti (*Minerva Ortop.*, 1951, No. 2, p. 153).

The authors illustrate the great preponderance of the iliac posterosuperior type of dislocation (occurring in 40 of 47 cases), and the marked preponderance of males (78.7 per cent) over females. The complications cited are fracture of the cotyloid roof (14 instances), sciatic paralysis (6 instances), fracture of the femur (4 instances), fracture of the caput femoris (3 instances), pelvic fractures (6 instances), and miscellaneous fractures (2 instances).

In general the patients followed for a time showed a surprising number of satisfactory results, even those cases in which the roentgenologic examination would seem to offer no such promise. Of the late results there were 2 excellent ones following closed reduction, 6 after operative reduction, 6 after reduction and arthrodesis, 1 after resection of the head of the femur, 3 after osteotomy, and 2 after neurolysis of the sciatic nerve (sciatic paralysis).

In those patients in whom fixation of the hip joint was not directly aimed at (arthrodesis), the greatest problem has been the loss of mobility of the joint, a problem which by no means has been solved by the advent of the antibiotics. The security offered by the antibiotics has, however, led to a trend towards surgery in the treatment of these late cases as against attempts at closed reduction. Nevertheless, in one instance closed reduction was successfully accomplished 57 days after the traumatic episode. One cause of loss of joint mobility in the after period has seemed to be too early and vigorous passive exercise after operation, and one of its sequelae has seemed to be the stimulus to calcification in the surrounding tissues.

Most of our conceptions with reference to the treatment of the old hip dislocation would seem to be upset by the work of Judet with the acrylic prosthesis, and the trend at the present time would seem to be to-

wards attempts at procuring a greater mobility after reduction. —*John W. Brennan, M.D.*

Resection of the Trochanter for Physiologic Treatment of Coxa Vara (Die Trochanterresektion als physiologische Behandlung der Coxa vara). H. Mau. *Zschr. Orthop.*, 1954, 85: 48.

The theoretical consideration for this operation is based on the growth of the bone in response to pull and pressure of the muscles in the general vicinity. Pull and pressure of the gluteus muscles cause the varus deformity. Pressure on the pelvicofemoral muscles, however, causes elongation of the femoral neck. Changes in the direction of growth of the femoral neck can occur only during the growth period. The author has observed changes in the angle of the neck of the femur in 12 year old children. Similar observations were made in rickets and in changes of the neck which caused epiphysiolysis of the capital epiphysis.

Resection of the trochanter was carried out in 2 cases of coxa vara of unknown etiology, in 1 case of epiphysiolysis, in 2 cases of congenital dislocation of hip, in 1 case of osteogenesis imperfecta, in 2 cases of chondrodystrophy (Morquio), and in 2 cases of congenital defect of the femur. The results were very satisfactory. In one-third of all cases the Trendelenburg sign became negative in 4 to 14 months. The gait improved in all cases. The best results were obtained in children between the ages of 3 to 12 years. The prognosis is better in cases in which the epiphysis is well preserved and horizontal in its course.

—*George I. Reiss, M.D.*

Reconstructive Operations for Tears of the Achilles Tendon (Wiederherstellende Operationen bei den Zerreissungen der Achillessehne). Karl Weisbach. *Wien. med. Wschr.*, 1954, 104: 361.

A complete tear of the Achilles tendon causes all functions of the Achilles tendon to cease. It is interesting to note that very often, in spite of the complete tear of the Achilles tendon, the plantaris muscle remains intact. The foot is kept in equinus position and the patient is unable to stand on the toes of the affected foot.

Partial tear of the Achilles tendon causes a persistent chronic pain in that area in which the condition is described as "achillodynia." Complete tear of the Achilles tendon requires operative repair. It is more difficult to repair a recent complete tear of the Achilles tendon. After a few weeks the ends of the Achilles tendon have consolidated and the repair is made much easier. The time element is not as important in incomplete tears of the Achilles tendon.

There are three ways of repairing the Achilles tendon: (1) a wedge-type repair in which the Achilles tendon is divided, approximated, and sutured; (2) the "flap" method in which a flap is formed of the proximal end of the tendon and then placed over the distal end, bridging the defect; (3) free transplantation of fascia lata from the thigh. Postoperatively a cast is applied from the knee to the toes, keeping the foot in plantar flexion. The patient is kept on bed rest for a week with the leg elevated. The longer the operation is postponed the more muscle atrophy occurs, decreasing the possibility of a good ultimate result. The author therefore suggests imbrication of the torn fibers of the Achilles tendon ends, and with the use of a mattress type suture the ends can be approximated. Fascia lata is removed from the thigh and wrapped around the operative site. In old cases the author suggests a double flap formation to bridge the defect.

—*George I. Reiss, M.D.*

End Result Study of 62 Stapling Operations. Alvia Brockway, William A. Craig, and B. R. Cockrell, Jr. *J. Bone Surg.*, 1954, 36-A: 1063.

At the Orthopedic Hospital in Los Angeles, 110 limb-lengthening operations, 35 limb-shortening operations, 22 epiphyseal stimulations, 162 epiphysiodeses, and 62 stapling operations have been done.

In 16 patients (33%) epiphysiodesis was done after the staples had been removed because of residual major discrepancy.

In most patients, the equalizing of limb-length discrepancy was disappointing, and for this reason stapling was followed by epiphysiodesis in 16 cases (33%).

In some patients, the stapling caused very little growth retardation in a 2-year period; in others, an appreciable improvement in the discrepancy was noted.

There were seven broken staples in 3 patients. In the first patient, roentgenograms showed one broken staple 34 months following surgery, and 6 months later a second staple broke.

There were 4 bow-leg deformities and 1 knock-knee deformity of significance; one of the former was caused by broken staples. In 8 patients, back knee deformity developed.

Staples buried in bone were a common finding, especially when the staples had been placed subperiosteally. There were 6 cases of epiphyseal arrest, in 5 of which the staples had been placed subperiosteally. In 3 cases, however, linear growth continued normally in spite of this complication, after the staples had been removed.

In a few cases the unstapled slower-growing extremity grew as fast as or faster than the stapled extremity after the removal of the staples, while in other cases the reverse was true.

The limb-length discrepancy in the 42 patients was due to poliomyelitis in 19, to trauma in 8, to congenitally short lower extremity in 10, cerebral palsy in 1, osteomyelitis in 1, Legg Perthes disease in 1, and arteriovenous fistulae in 2.

In six patients in whom the staples had been extraperiosteally placed there was considerable spreading and extrusion of the staples. This was seen on the roentgenograms in from 2 to 8 months. The staples were replaced in these 6 patients. There was no direct evidence later that replacement of the staples caused epiphyseal damage. There were 9 other patients in whom there was extrusion of the staples to a lesser degree; in these, the staples were not replaced.

The average time the staples remained in place was 2 years and 12 days. The average age of the 42 patients was 7 years and 3 months old. Twenty-nine of the patients were males and 13 were females.

In the discussion, Walter P. Blount emphasized that all staples should be inspected before the wound

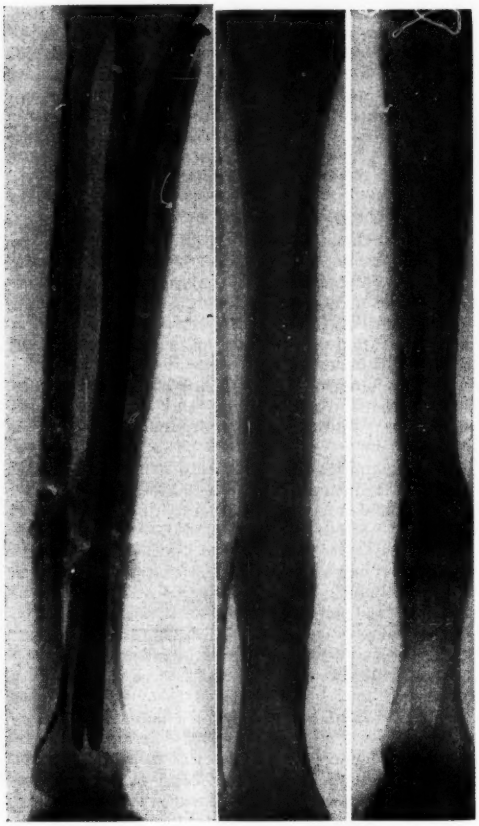


FIG. 1. FIG. 2.

FIG. 1. (Werwie). After operation.
FIG. 2. End result after removal of nail.

is closed. A frequent mistake is to let one leg of a staple placed posteriorly slide along the cortex of the bone instead of penetrating the bone squarely. This can be avoided if the staple is aimed toward the center of the bone. Flexion of the knee facilitates proper aiming. The anterior third of the fibula should be cut away in order to expose the posterior portion of the tibia on the lateral side. After the epiphyseal plate of the fibula has been curetted, the loose piece should be replaced.

In almost 200 stapling operations, Blount had 1 bow-leg deformity, 4 knock-knee deformities, and 2 back-knee deformities. One patient in this series of cases required no treatment; osteotomy was necessary in one patient because the limbs were of equal length.

If faulty placing of the staples or later extrusion caused deformity, it was recognized early and was corrected by rearrangement of the staples.

—*C. Fred Goeringer, M.D.*

Contribution Concerning Treatment of Lower Leg Pseudarthroses (Beitrag zur Behandlung von Pseudarthrosen des Unterschenkels). M. WERWIE. *Chirurg*, 1954, 25: 405.

The standard procedures of drilling (Beck), the bone splintering (Kirschner), and the free bone graft transplantation require very long postoperative fixation. The author therefore used the Kuentscher intramedullary nail which was considered not indicated by Boehler and M. Lange. The advantages of intramedullary nailing are as follows: (1) fixed osteosynthesis without need for immobilization with plaster, (2) shorter stay in the hospital, (3) earlier ambulation, (4) nonunions near the joint down to 6 cm. from the ankle joint could be included, and (5) sinuses offer no contraindication.

The surgical approach is made without a tourniquet, with a preliminary resection of 1 to 1½ cm. of the fibula in the pseudarthrosis level and suture of the bone ends. After extensive elevation of the periosteum, excision of the callus and scar tissue, and of the distal-proximal medullary bone cover is done. A spreading double nail is driven in from a window made over the tibial tuberosity, which results in a firm osteosynthesis. After the insertion of 2 rubber tubes and tight closure of the periosteum and skin, a medicopaste bandage is applied from foot to knee. Ambulation can be started after 8 days.

The patients of this series could resume work after 4 to 6 weeks. One year later after complete consolidation the intramedullary nail is removed. In all cases early and good callus formation was observed. Two patients developed sinuses. The intramedullary nailing avoids harmful sliding and shearing forces and achieves ideal weight bearing pressure and muscular pull. On the basis of his good results the author recommends this method exclusively.

—*Ernest H. Bettmann, M.D.*

FRACTURES AND DISLOCATIONS

The Treatment of Acromioclavicular Luxations (Il trattamento della lussazione acromion-clavicolare). A. FRANZ. *Chir. org. movim.*, 1953, 39: 327.

THE AUTHOR reviews the results of treatment of 139 cases of the supraacromial type of dislocation of the acromioclavicular joint. This material was observed at the Rizzoli Institute, Bologna, Italy, during the past 40 years. Of the patients, 72 received merely orthopedic treatment of the usual type, 55 were treated by the transcutaneous method of Perdu-Mancini (as modified by Pais in 1947), and the remaining 12 were treated surgically. Since 1934 (when the ambulatory clinic was installed) the patients have been followed up for periods of 10 to 15 years.

With reference to the ultimate results of the orthopedic methods of treatment, suffice it to say that they were not essentially different from those reported in the literature; that is, they were inconstant and imperfect, functionally, esthetically, or both.

The transcutaneous fixation operation as modified by Pais (using a Kirschner wire instead of the nail of Perdu-Mancini) consists essentially in reducing the clavicle (it is used only in recent lesions) and fixing it

in place by transfixation of both the acromion and the acromial end of the clavicle by means of a Kirschner wire passed through a special guide of Pais' own invention (Fig. 1). After this transfixation the wire is cut off 1 cm. from the skin and a lead ball is pressed onto its end to prevent central migration. External migration is prevented by a foam-rubber pad fitted over the lead ball. This wire is left in place for 25 to 30 days, during which time the arm is immobilized by a cast.

Thirty-eight cases have been treated by this method, up to December 1950. With the 5 cases of Mancini and the 12 of Pais, this method has been used in 55 patients altogether. Of these, 20 had recent subluxations, 32 had recent complete luxations, and 3 had the inveterate type of luxation. The technique was carried out in all but 3 instances in from 2 to 4 days. In the 3 cases the respective intervals between the accident and the transfixion were 2, 3, and 12 weeks.

The immediate results from this method were good. The reduction was maintained in all of the patients except those with the 3 inveterate luxations, 2 who did not tolerate the wire fixation, and 3 in whom the wire did not hold (external migration). With regard to the functional results 85 per cent (37) of the 47 patients in whom the reduction was maintained presented complete mobility and absence of pain, the remainder either complained of pain on extreme movement or some stiffness in the shoulder joint.

Later observation of the 55 patients treated by the transcutaneous fixation method revealed reluxation in 8. Of the 25 patients available for control at a distance, 16 had excellent functional results, 6 had some slight rigidity and pain in movement of the shoulder joint and the remaining 3 had a persistent slight degree of subluxation. On the whole, it would seem that the method of transcutaneous fixation should be reserved for recent conditions and should be applied as early as possible.

The 12 patients treated by open operation all had complete and inveterate luxations. Acromioclavicular osteosynthesis was carried out in 4. This was done with a Lambotte nail by the method of Buedinger, Bier, and Mannheim. The results were excellent in 2 of the 4 patients, discrete in 1 patient (mild degree of subluxation persisting), and poor in 1 (broken nail with recurrence of the luxation).

Syndesmopexia of the coracoclavicular joint associated with acromioclavicular synthesis afforded good results in 2 patients and discrete results (mild rigidity and pain) in 4.

On the whole, the author believes that the problem of treatment of acromioclavicular luxations is not solved. —*John W. Brennan, M.D.*

An Attempt to Explain Fracture Types; Experimental Studies on Rabbit Bones. CARL HIRSCH, APOSTOLIO CAVADIAS, and ALF NACHEMSON. *Acta orthop. scand.*, 1954, 24: 8.

CLINICALLY, certain types of fracture are considered to be due to specifically described forces. Such fractures, most commonly, are close to joints. For example, in the lower part of the human tibia supination and pronation traumas are described.

In the present article, the authors undertook to study the reasons for the different localities and types

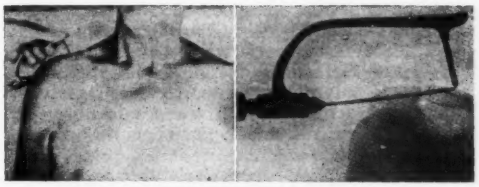


FIG. 1 (Franz). Temporary acromioclavicular synthesis with a Kirschner wire passed through the skin.

of fractures in the tibia and femur in rabbits. The fractures were produced in a compression apparatus. Forces were variously brought to bear in a vertical direction, in an oblique direction, by twisting in vertical and oblique positions, by slowly increasing weights, and by falling standard weights.

It was found that vertical loading of the tibia produces fractures close to the metaphysis. Oblique loading produces more diaphysial fractures, and when the load is of short duration, comminuted fractures. Twisting below 10 degrees of the tibia does not change the amount of force necessary for a fracture, but breaks the bone closer to the ends. Twisting above 10 degrees tends to result in spiral fractures near the middle of the diaphysis.—*Kenneth E. Sherman, M.D.*

The Influence of Hormones and Especially Desoxycorticosterone, Cortisone, and ACTH on the Healing of Experimental Fractures (Influence de différentes hormones et spécialement de la désoxycorticostérone, de la cortisone et de l' A.C.T.H. sur la consolidation des fractures expérimentales). R. FONTAINE, P. MANDEL, E. WIEST, A. EBEL-GRIES, and J. BURCKARD. *Lyon chir.*, 1954, 49: 513.

IN THE PRESENT article, the authors report on the influence of some hormones in the healing of experimental fractures in dogs. A precise technique was developed for the production and firm fixation of transverse fractures of the tibial shaft in dogs. Intramedullary nailing with firm impaction of the fragments was carried out. Under such circumstances fractures always healed in a period of 6 weeks without any fibrocartilaginous tissue formation in the callus, and with a focal phosphatase level of 148 Roche units.

The action of thyroxin was first studied; 1 mgm. daily was injected. Although the callus formation was histologically identical to the formation of callus in normal animals, the healing time of the fracture was reduced to approximately one-half the time needed in normal dogs (24 days). The focal phosphatase was increased to 279 Roche units.

The action of desoxycorticosterone (DOC), cortisone and ACTH were then studied. DOC was given in doses of 850 to 2,500 mgm. for 42 to 155 days; cortisone was given in doses of 750 mgm. to 3,000 mgm. for 15 to 62 days, and ACTH was given in daily injections of 5 mgm. for 28 to 124 days. Under the influence of these hormones the authors observed:

1. An abnormal densification of the ends of the bone fragments radiologically, with bone resorption causing a separation between the fragments and an aspect of nonunion.

2. The appearance of poorly vascularized fibrocartilaginous tissue between the fragments without any evidence of new bone formation. Union took place by slow periosteal callus formation. In the experiments with ACTH, only after 100 days were bony trabeculae found in the periosteal callus near the fracture site. Bony union occurred in only one of the 12 animals, and after 120 days.

3. The focal phosphatase levels were lower than normally. They were approximately 92 units with DOC, 73 units with cortisone, and 65 units with ACTH.

The authors conclude that some hormones, like thyroxin, speed up the formation of callus, and others such as ACTH slow down this process by a local action on the tissues, and without interfering with the mineral metabolism of the bones. It is believed that the increase or decrease of callus formation is due to a local increase or decrease of phosphatases. The role of this ferment is more important in the formation of intramedullary callus than in the formation of the periosteal callus. —*Joseph C. Mulier, M.D.*

Experiences with the Onlay Graft for the Treatment of Nonunion and for Fractures with Delayed Union (Erfahrungen mit dem Anlegespan bei der Behandlung von Pseudarthrosen und von Bruechen mit verzoegerter Heilung). J. ENDER. *Chirurg*, 1954, 25: 409.

TEN LOWER LEG PSEUDARTHROSES, 1 upper arm nonunion, and 17 patients with delayed union were treated with the onlay graft. The shortest interval between accident and operation was 12 months, the longest, 128 months, for nonunion; the shortest interval in delayed union was 12 weeks and the longest, 14 months. This method avoids resection of the bone ends and opening of the medulla. Only occasionally excessive callus has to be removed. The onlay graft serves as a stimulant for callus formation and no foreign materials like screws or wires are necessary. The length of the graft, often removed from the opposite extremity, is 8 cm. Sometimes osteotomy of the fibula and correction of a varus or valgus deformity is necessary.

The shortest time for complete union was 84 days, the longest 150 days, and the average was 90 days—also reported by American authors employing the original technique taught by Phemister. Bank bone was also used with the same good results. In cases with delayed union the healing time averaged 104 days, the shortest time being 44 days. The decision to carry out this technically simple and safe procedure is facilitated by the fact that the healing time of the bones is not prolonged. —*Ernest H. Bettmann, M.D.*

Contribution to the Study of Retrolunar Luxations of the Carpal Bones Associated with Fracture of the Scaphoid (Contributo allo studio della lussazione retrolunare del carpo associata a frattura dello scafoide). C. PRIGNACCHI and S. ZAPPOLI. *Chir. org. movim.*, 1953, 39: 308.

THIRTEEN instances of retrolunar dislocation of the carpal bones with associated fracture of the scaphoid are reported. These cases comprise material from the Rizzoli Orthopedic Institute of the University of Bologna, in Italy. In 4 cases, in addition to the fracture of the scaphoid there was an avulsion of the styloid process of the ulna, in 2 there was avulsion of the styloid process of the radius, and in 1 case there was an avulsion of both these processes. In none of these patients was there any evidence of anomalies in the shape or arrangement of the bones, anomalies which have been rather pointedly emphasized by some authors. The present authors ascribe the dislocation to purely mechanical causes. They believe that in their patients the immediate cause was not solely a hyperextension of the hand, but rather a hyperextension and radial abduction of the wrist joint. This would best explain the fractures of the navicular bone which would be impinged upon at its weakest point by the radial apophysis.

The results of treatment of the entire group of 13 luxations proved optimal in 6 cases, good in 3, poor in 3, and unknown in 1 case. In the 9 patients who could be reached for control at a distance, the results were optimal in 6, good in 1, and poor in 2.

With reference to the type of treatment, 9 patients were treated by the closed method, i.e., the displaced bones were manipulated back into their normal position under local or general anesthesia following manual traction on the joint to open up the bone spaces for their reception; 4 patients were treated by open operation. The type of treatment (open or closed) employed depended chiefly upon the interval which had elapsed between the time of the accident and the reduction; the longest interval between injury and reduction by the closed method was 18 days; however, in the majority it was a matter of a few hours. The time intervals in the 4 instances of open operation were 10 days, 20 days, 1 month, and 2 months.

Specifically, for the patients treated by the closed method (9 cases), immediate results were optimal in 5 (55.5%), good in 1 (11.1%), poor in 2 (22.2%), and unknown in 1. Seven of the 9 patients could later (in from 2 to 14 years' time) be found for follow-up control. Of these, 5 had continued to have perfect function in the involved joint and complete absence of subjective symptoms.

For the 4 patients treated by open operation, immediate results were optimal in 1 (25%), good in 2 (50%), and poor in 1 (25%). Two of these 4 patients were followed; in 1 the results were optimal and in the other, good.

The authors believe that the best results in the treatment of these dislocations will be obtained in those instances in which the patient is put immediately into the hands of the orthopedist or traumatic surgeon. However, even in the late cases they consider that an attempt should be made at reduction by the closed method. If closed reduction cannot be done, open reduction is indicated. This open operative reduction should be conducted through a 2 inch dorsal incision over the joint; however, if it seems probable that excision of a bone—particularly of an anteriorly luxated lunate bone—will be necessary, an anterior incision is preferable. A 2 inch incision is made over the wrist anteriorly, the tendon of the flexor pollicis longus is pushed to the radial side and the other tendons, together with the median nerve, are pushed to the ulnar side.

In any event a rather long period of immobilization in a cast for a period of 50 to 60 days is advis-

able in order to favor union of the two fragments of the navicular. —*John W. Brennan, M.D.*

ORTHOPEDICS IN GENERAL

Report on a Simple Method of Bone Preservation (Ueber eine einfache Methode der Knochenkonservierung). G. HAUBERG and E. BRUCKSCHEN. *Chirurg*, 1954, 25: 249.

THE USE of bone banks in smaller hospitals is strongly advocated. Since Axhausen's experiments, the immediately used autotransplant has given the best results, while heteroplastic material, including ivory, yielded the poorest results. The most popular methods of bone conservation, refrigeration (minus 20—30 C.) and the use of merthiolate, still show a rather high percentage of failures—up to 15 per cent with refrigeration, and almost twice as many with merthiolate. The authors used a new organic mercury solution, viz., "cialit," with a markedly bacteriostatic and fungicidal effect, in a nontoxic solution of 1:5000, which is kept at normal room temperature and is changed every 4 to 6 weeks. If it is not sterile after that time the whole bone is discarded. Wassermann-positive, tuberculous, and tumor patients are excluded. All specimens can be made available without blood grouping.

Three examples of successful bone grafting are demonstrated: (a) a shelf operation in a case of congenital dislocation of the hip, (b) anterior graft ankle arthrodesis, and (c) finger enchondroma. The authors were able to collect 80 successful cases in which bank bone up to 5½ months old was used. In conclusion, the authors voice the opinion that this type of bone graft is well tolerated and transformed.

—*Ernest H. Bettmann, M.D.*

Denervation in Posttraumatic Muscular Regeneration; Experimental Research (La denervazione nella rigenerazione muscolare post-traumatica; ricerche sperimentali). LUIGI ROVATI and GIORGIO CASTOLDI. *Ann. ital. chir.*, 1953, 30: 787.

TWELVE RABBITS were used in this second study of muscular regeneration. The first study dealt with simple traumatic muscular lesions and their processes of healing. In the present study there was added experimentally to the muscular trauma the effect of partial or complete denervation. In the partial denervation the sciatic nerve was simply squeezed with a Kocher forceps; in the complete denervation the sciatic nerve was cut through and even a couple of centimeters of length was excised. Six of the animals were used for partial denervation and 6 for complete denervation experiments; both hinder extremities were used in each animal. The gastrocnemius muscles experimented upon were also simply crushed with the Kocher forceps, as in the previously reported experiments.

After periods of 2, 5, 10, and 25 days the animal was sacrificed, and the traumatized portion of the muscle was excised and fixed for histologic study. The results in general were in accord with those obtained by other authors (Saunders and Sissons: *J. Bone Surg.*, 1953, 35: 113). There was not a great deal of difference in the manner of regeneration of the muscle fibers between the nondenervated and the denervated rabbits. The process of regeneration was perhaps somewhat slower in development in the denervated muscles and the regenerated muscle fibers were slower in assuming normal thickness and maturity. In the denervated traumatized muscle, just as in the nondenervated traumatized muscle, the process of regeneration takes place from the periphery of the crushed area towards the center.

The most important factor in the process of regeneration would seem to be the degree of destruction exercised by the crushing pressure of the Kocher hemostat on the muscle tissue. Where the sarcolemma sheath was preserved, the new muscle fiber would grow along this sheath relatively rapidly and straight; where the sarcolemma sheath was more or less destroyed, the new fiber seemed to have trouble forcing its way through the newly formed granulocytes; its growth was slow and tortuous and there were seen the peculiar clubbed ends of the regenerating fibers which Saunders and Sissons consider as an expression of the difficulty of the muscle fiber finding its way through the granulocytic tissue without the guidance of its sarcolemma sheath.

Once the muscle has regenerated, however, the place where the trauma occurred is difficult to identify; the damaged area looks pretty much like normal muscle tissue except in the instance of total denervation where, after a couple of weeks, the process of nerve atrophy begins to modify the picture.

On the whole, it may be concluded that in muscle injuries any involvement of the supplying nerve will not have a noticeable effect on the process of regeneration, whatever effect it may have on the ultimate prognosis. —*John W. Brennan, M.D.*

The Present-Day Evaluation and Treatment of Idiopathic Juvenile Scoliosis (Valutazione e terapia attuale della scoliosi idiopatica giovanile). FRANCO FUSI. *Bol. Soc. piemont. chir.*, 1954, 24: 385.

PHOTOGRAPHS are of little value in the estimation of the character and severity of the scoliotic process; roentgenograms are needed. The roentgenographic examination is carried out with a powerful teleroentgenographic apparatus at a focal distance of 3 meters. The pictures are prepared in 6 different postures of the patient, 3 in the supine position and 3 in the erect posture. The 3 roentgenograms in the supine posture are prepared: (1) in anteroposterior projection with the patient in an indifferent pose; (2) the exposure is prepared as before but with the patient leaning toward the right flank; and (3) the process is repeated with the patient leaning toward the left flank. The roentgenograms in erect posture are also taken in anteroposterior projection in indifferent pose, with a 5 cm. (more or less) block beneath the right foot and with the block then beneath the left foot. The estimations with reference to the gravity of the scoliotic deformations are made according to the method published by Cobb. This method is also used to evaluate the amount of rotation deformity and the amount of correction which can be attained.

In the matter of treatment it is important to procure the patient as early as possible; for this reason the

author proposes the bi-yearly roentgenographic examination of all school children, and 3-monthly examination of all children in whom the deformity is detected, until the cessation of vertebral growth at the fifteenth to sixteenth year of life. It is especially emphasized that once the deformity is established—particularly the secondary (compensatory) deformity—total straightening of the primary scoliotic deviation is impossible, since the secondary deformity would throw the entire body off balance.

Orthopedic treatment is the more important in that a certain number of patients will not be rendered stationary or improved by surgery, but will become worse progressively as long as the patient bears the body weight in the upright posture. The author's orthopedic treatment consists essentially of the methods and use of the apparatus described by Risser. In the bi-valve chest case of Risser the body is suspended with a frame on a tape belt and the manipulation of the apparatus permits putting counter action pressure on the deformity. The disadvantage of this method consists in the difficulty in keeping the child off its feet for the requisite period of time (about 6 months).

If the orthopedic methods are ineffective, surgery may be indicated. For this purpose the author has recourse to a slight modification of Hibbs' spinovertebral arthrodesis, using spongeous bone obtained from the bone bank.

The control roentgenogram taken a year later shows that despite the stiffening of the spine, the scoliotic deformity has become worse, but with relief of the original painful symptoms. The patient, a girl, was 18 years old at the time she was operated upon.

In the case of a 14 year old girl there was progressive deformity under orthopedic treatment. An excellent correction by arthrodesis was then obtained; however, a year later the deformity was seen to have progressively increased, despite surgery. In this instance the author ascribed the failure of all treatment attempted to the persistence of the unknown deforming factors.

—John W. Brennan, M.D.

Air Arthrography of the Knee After Removal of the Semilunar Cartilage, Showing Regeneration of the Cartilage (Ménisques du genou étude arthropneumographique de leur régénération après méniscectomie). SERRA DE OLIVEIRA. *Rev. chir. orthop.*, Par., 1954, 40: 212.

THE AUTHOR studied 20 postoperative air arthrographies taken at intervals of 25, 35, 45, and from 120 to 180 days after the surgical removal of menisci of the knee.

Twenty-five days after the operation an image of the regenerating cartilage was seen. This cartilage was smaller than the original meniscus. After 35 days the size and density of the regenerating meniscus were about equal to the size and density of a normal one. After 45 days the regenerated meniscus appeared normal on the x-ray film. At 120 to 180 days after surgery, there was no difference from the picture of the forty-fifth day.

Although the aspect and the shape of the regenerated knee cartilage are equal to a normal meniscus radiologically, the histologic examination shows these regenerated menisci to be very different in structure. Ruptures of the cartilage of the knee do not heal unless the tear passes through the vascular zone and synovial attachment of the cartilage. Fibrous tissue regenerates only from the synovial attachment. Only complete surgical removal of the meniscus provides the conditions necessary for regeneration of the cartilage.

The author believes that a regenerated meniscus is necessary for good function of the knee, and therefore that total excision of the meniscus is mandatory.

—Joseph C. Mulier, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Venous Thrombosis of the Upper Extremity Complicated by Pulmonary Embolus. Case Report. ARTHUR H. AUFSES, JR. *Surgery*, 1954, 35: 957.

A CASE of "spontaneous" axillary vein thrombosis complicated by pulmonary embolism, with recovery, is reported. Although most cases of thrombosis of the upper extremity follow either mild repetitive trauma, congestive heart failure, or obstructing neoplasm, no etiologic factor could be established in the author's case. Anticoagulant therapy is recommended in the initial treatment of thrombosis of the upper extremity in an attempt to prevent embolization.

—Earl W. Cauldwell, M.D.

The Use of Plastic Material in Vascular and Esophageal Surgery (Considerazioni sull'uso dei materiali plastici in chirurgia vascolare ed esofagea). ANGELO RIBERI. *Gior. ital. chir.*, 1954, 10: 471.

THE AUTHOR (a Fullbright fellow in Surgery at the University of Indianapolis) reports on the use of plastic material for grafts in replacing parts of the aorta and esophagus in dogs.

The abdominal or thoracic aorta was substituted in part by tubes of nylon and polyethylene, or nylon and lucite. No thrombosis developed if the diameter of the grafted aorta was not less than 1.5 cm.

The grafts were fixed at the two ends by everting sutures of No. 0000 Deknatel silk on atraumatic needles. The grafts became rapidly adherent. In from 5 to 6 months the grafts were covered by a fibrinous layer of endothelium.

In about 20 dogs the esophagus was resected for a distance of 4 to 8 cm. and then replaced by a tube of nylon and polyethylene. These tubes acted as supporting structures to the formation of a new passageway. At first the tube is covered by mediastinal pleura. After some time the tube is free in the lumen and is vomited. After this the new passageway becomes epithelialized from both ends and this is completed only after 3 to 4 months.

—Lucian J. Fronduti, M.D.

Reinforcement of Vascular Grafts with Viable Intestinal Segments. JOHN M. HAMMER, PATRICK H. SEAY, EDWARD J. HILL, and FRANK W. PRUST. *Arch. Surg.*, 1954, 69: 198.

THE USE of vascular grafts has progressed from the experimental surgical laboratory to the operating rooms of the larger hospitals, where replacement of segments of major vessels has become a relatively common procedure. Much of the recent literature is concerned with methods of preserving blood vessels, technical procedures, means of reinforcing grafts, and with speculation as to the outcome of these grafts.

Although the immediate results in vascular grafting have been exceptionally satisfactory, none of the grafts has gone for a sufficiently extended period to determine whether their fate depends upon the dilatation and attenuation produced by the continual pounding of arterial pressure, and upon becoming aneurysms.

Investigators have shown that venous homografts in dogs will dilate in 2 to 4 years. It is known that no smooth muscle will function when it is deprived of its nerve and blood supply; therefore, all blood-vessel grafts must be considered as dead tissue. Touroff demonstrated that venous implants in the arterial tree of animals tend to dilate and form aneurysms after 3 years. Arterial homografts may last slightly longer. Heterografts thrombose early, but if they last through the initial stage, they may survive as long as the homografts.

The vascular grafts being dead when placed in the vascular tree, they are eventually invaded with fibroblasts, and a nonfunctioning fibrous graft results. The authors believe that these will eventually dilate under constant arterial pressure to form aneurysms. To prevent aneurysmal dilatation of a venous or arterial graft, the authors selected intestinal segments for reinforcement of a vascular graft because of their proximity to the regions where vascular grafts are commonly used and because the intestine contains smooth muscle in its wall. The authors have used ileum and jejunum with intact mesenteric vessels to supply vascular grafts with a living, functioning, smooth muscle layer having the nerve and blood supply of the host.

The method and surgical procedure are described. A series of 10 animals was prepared with each type of blood vessel graft, plus an additional series of 10 control animals. A segment of bowel was isolated and wrapped around the graft.

The authors concluded from their experiments that intestinal segments can be used to reinforce homologous or heterologous vascular grafts, fresh or preserved, in dogs. In this series dilatation has not occurred up to 2 years. The smooth muscle of these intestinal segments is viable after 2 years, as has been proved by its response to drug stimulation. The longitudinal and circular smooth muscle fibers of the intestine and the circular smooth muscle fibers of the mesenteric artery do not show the traditionally expected similarity in degree of reaction to a given stimulus. The viable intestinal segments need not be placed about the blood-vessel graft when the original surgery is done; they may be used as reinforcements in a second stage procedure at a later date. *—John H. Mohardt, M.D.*

Embolectomy from Arteries of the Lower Limbs; an Analysis of 15 Cases. FIELD C. LEONARD. *N. England J. M.*, 1954, 251: 595.

DURING the 4 year period from 1950 through 1953, the author performed 15 embolectomies on 13 patients, at the aortic, iliac, and femoral bifurcations. Clinical diagnosis can usually be made by the history of sudden pain followed by paresthesias, coldness, and early paralysis of the affected leg. Pulses distal to the involved bifurcation are absent. Clinical discovery of

a source of embolism is a major factor in diagnosis, but cannot be entirely relied upon. Distinction from arterial thrombosis is academic. Oscillometry may be of aid in an obese patient; aortography is not necessary or desirable. The femoral pulse is almost always palpable on the side of a femoral embolism. Skin mottling and temperatures are not reliable guides to the level of the block.

One aortic, 3 iliac, and 11 femoral embolectomies were performed in 8 females and 5 males. In 9 instances the source of embolism was arteriosclerotic heart disease, either with atrial fibrillation or recent or past myocardial infarction; in 6 instances the source of embolism was rheumatic heart disease with mitral stenosis and atrial fibrillation. The average age was 60 years; patients with arteriosclerotic sources of embolism were an average of 11½ years older than those with rheumatic heart disease.

Seventy per cent of the operations were successful. Despite a 46 per cent hospital mortality, no patient died as a result of operation and no limbs were lost in the last 7 embolectomies. Embolectomy should be performed within 8 hours if possible. In all but 2 cases seen within 12 hours, the operations were successful. Local anesthesia was usually sufficient.

Half the deaths in this series were from pulmonary embolism despite adequate anticoagulation. Routine femoral vein interruption with lower limb embolectomy should be considered. The presence of retrograde arterial blood flow following embolectomy had good prognostic significance in this series of cases.

—S. Lloyd Teitelman, M.D.

The Use of Tubes Constructed from Vinyon "N" Cloth in Bridging Arterial Defects—Experimental and Clinical. ARTHUR H. BLAKEMORE and ARTHUR B. VOORHEES, JR. *Ann. Surg.*, 1954, 140: 324.

EXCISIONS OF 17 arteriosclerotic abdominal aortic aneurysms and 1 arteriosclerotic popliteal aneurysm were performed during the preceding 10 months. There were 10 survivors in this group; all were symptom-free and all had satisfactorily functioning prostheses. The longest follow-up period in this group was 10 months. Two of the patients had implantations of the simple straight tube prostheses, 6 had implantations of "Y" tube prostheses, and 1 had an implantation of a by-pass type of "Y" tube prosthesis. The latter type was necessitated by the presence of a previous wiring and occlusive banding procedure.

There were eight hospital deaths in this group, and all of these could be related directly or indirectly to the operative procedure. Two of the 8 deaths occurred in the operating room when the proximal aortic clamp caused a rupture of the aorta, resulting in a fatal hemorrhage. This accident has subsequently been controlled at operation, even when rupture has occurred, by applying the proximal aortic cloth cuff mentioned in the article. One of the 8 deaths occurred in the operating room when a cardiac arrest was precipitated by a sudden drop in the arterial pressure following the gradual release of the occluding clamp on the aorta. One death occurred in the immediate postoperative period as a result of hemorrhagic shock secondary to disruption of an anastomotic suture line in an aorta in which degeneration was advanced. One death occurred in the immediate postoperative period after an exceedingly long and difficult procedure. At postmortem examination, a thrombosis of the left femoral artery was found to extend into the external iliac artery and left branch of the "Y" prosthesis. Three deaths occurred later in the postoperative period, and the major cause of death was believed to be acute renal insufficiency.

In every case of death occurring in the postoperative period, postmortem examination revealed structural and functional integrity of the prosthesis, with one possible exception in which thrombosis occurred in the left common femoral artery, in the left external iliac artery, and the left limb of the "Y" prosthesis.

Data are presented covering 31 implantations of vinyon "N" textile prosthesis bridging arterial defects in 30 mongrel dogs, along with observations of the host repair mechanism.

The authors believe that tubes fashioned from textiles of suitable pore size and woven from essentially biologically inert materials may serve with a high degree of functional success as artery-bridging prostheses. The prostheses were fashioned from 37 denier, 144 by 90 strands per square inch vinyon "N" cloth folded and stitched with vinyon "N" thread longitudinally, to form tubes of desired length and diameter.

Credit is given to pioneer work in autoplastic, homoplastic, and heteroplastic vessel transplantation of both fresh and preserved specimens. The transposing of knowledge gained from the laboratory to the clinical problem and the establishment of a source of supply of human autogenous vessel grafts have been two important steps made in the last decade. Artery-bridging tubes constructed from materials foreign to the body have undergone parallel investigation. The advantage of such materials is their ease of procurement and supply. *—LeRoy J. Kleinsasser, M.D.*

BLOOD; TRANSFUSION

Intrasplenic Blood Transfusion; Preliminary Report. SAROKU FUJIWARA, HIROSHI KAWAISHI, AND KIYOSHI MATSUI. *Arch. jap. chir.*, 1954, 23: 26.

BLOOD transfusion has become more and more important, and the patient often stands in need of a large quantity of blood injected rapidly. The limitation of rapid intravenous injection results in overload of the heart and lungs, and in these instances, according to the authors, intra-arterial transfusion is used in place of it. Many other routes of transfusion including bone marrow, the peritoneal cavity, the heart, the corpus cavernosum of the penis, and the major fontanelles have been utilized. In experiments on dogs, consisting of radiographic delineation of the portal vein and its tributaries by means of intrasplenic injection of a contrast medium, the authors discovered that although large quantities of blood or fluid were injected intrasplenically at great speed, these injected substances were driven out of the spleen and into the portal vein in several seconds without any remarkable swelling, rupture, or bleeding of the spleen.

Irreversible shock was produced by acute bleeding at the rate of 40 c.c. per kilogram, at which point both arterial and venous blood pressures were at low values.

Blood of another dog was then transfused intrasplenically at a high rate of speed. The arterial blood pressure rose rapidly to normal levels and although the venous blood pressure rose temporarily as well, it soon returned to normal levels. The dog was found to recover from severe shock by means of such rapid intrasplenic blood transfusion. No remarkable changes were seen in the dog's liver or spleen 30 days after the transfusion. In the case of intravenous transfusion of a large quantity of blood at the same rapid rate, the venous blood pressure rises to extremely high levels and continues at this level for a prolonged time, with consequent overloading of the heart and lungs to the extent that some dogs die of pulmonary edema.

The authors believe that intra-arterial blood transfusion is quite similar to the intrasplenic route, and they consider intrasplenic transfusion superior to intravenous transfusion. The new method of intrasplenic blood transfusion is considered an intraportal procedure. Additional useful techniques are the intrasplenic injection in small quantity, of substances to outline the portal venous bed and determination of the circulating plasma time through the liver.

—Allan D. Callow, M.D.

Intra-Arterial Transfusion in Hemorrhagic Shock
(Sul meccanismo di azione della trasfusione endoarteriosa quale mezzo di rianimazione nello shock emorragico). G. Oselladore and G. Damia. *Chirurgia*, Milano, 1954, 9: 87.

The authors performed experimental research on dogs. The dogs were bled to shock level and blood was then transfused directly into the different arteries, principally the carotid arteries and the femoral arteries.

The conclusions were as follows: (1) the resuscitative effect of intra-arterial transfusions depends upon blood replacement under pressure and the subsequent improved coronary flow; (2) the transfusions must be made before the tone of the peripheral vessels has fallen; (3) intra-arterial transfusion can be performed with good results in any artery used—when the carotid artery is used and the blood flow is towards the brain, the heart flow is improved as well as the brain flow; and (4) when vasomotor paralysis accompanies hemorrhagic shock the resuscitative effects of intra-arterial transfusions may be obtained by using blood containing a powerful vasoconstrictor.

—Lucian J. Fronduti, M.D.

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

The Effects of Various Methods of Treatment on Wound Healing; an Experimental Study. PETER RANDALL AND ROSE J. RANDALL. *Plastic & Reconstr. Surg.*, 1954, 14: 105.

SINCE the healing of a wound is influenced by many variables, i.e., depth and extent of the wound, condition of the patient, amount of damaged tissue, amount of contamination and of active infection, the authors' study was conducted in the laboratory on standard superficial wounds, to compare the effects of several methods of treatment.

Nineteen ways of treating wounds were studied; a minimum of 10 animals was used for each method of treatment. Partial thickness wounds were made on the skin of the back with a razor blade. Biopsies were taken to insure uniform depth, animals with unsatisfactory abrasions being discarded. The animals were sacrificed in 1 week, biopsies were made, and the wounds grossly evaluated. Good healing was considered present when a majority of wounds showed not only complete healing of the epithelium but also good skin adnexae such as hair follicles.

Good healing occurred with several bland ointments sparsely impregnated in No. 44 fine mesh gauze —petrolatum, 4 per cent xeroform in petrolatum, 1/2000 of merthiolate in petrolatum and silicote. Aureomycin dressings and foille ointment showed good healing when used copiously. The use of dry fine mesh gauze, dry coarse mesh gauze, and Webril was associated with good healing, with little difference between them. The average weight of two animals in each of the above groups showed a consistent gain.

Most of the wounds left exposed with no dressing were completely healed but they showed either a diminished number of hair follicles or absence of follicles, and two animals showed progression in the degree of wound depth by exhibiting full thickness loss. The dried exudate provided adequate protection while it remained intact, but when suppuration occurred complete loss of all viable epithelial elements was present. This same picture occurred in animals in which an eschar was produced by tannic acid or silver nitrate. Healing, when present, was poor with loss of hair follicles. The animals in these groups showed an average weight loss.

More irritating substances, such as balsam of Peru and scarlet red ointment in fine mesh gauze, were associated with complete full-thickness skin loss. Furacin soluble dressing and chloresium ointment were somewhat analogous.

Poor epithelization was seen in the animals treated with aeroplast spray, Lambert burn bomb, and zinax; the majority showed full-thickness loss. Severe collapse of the animals occurred after the application of aeroplast. Four of the animals could not be revived and 4 died subsequently. A high death rate occurred among those treated with zinax.

Low toxicity and a low death rate, associated with good healing, were reported with the use of all agents.

—Earl H. Klabunde, M.D.

Treatment of Soft Tissue Trauma of the Face. FRANK MASTERS, NICHOLAS GEORGIADE, CHARLES HORTON, and KENNETH PICKRELL. *J. Am. M. Ass.*, 1954, 156: 105.

IN THIS MODERN mechanical era, soft tissue injuries of the face are becoming more frequent. Prompt, adequate, and proper therapy is necessary to avoid grotesque deformity, with it's inevitable physiological and psychological consequences.

There are certain purely mechanical factors that play an important role in the healing of wounds, and these must be constantly kept in mind. All devitalized tissue and foreign bodies must be removed. Hematomas must be evacuated, and hemostasis must be absolute. Dead space must be closed and the wound sutured without tension. Every attempt must be used to obtain a layer-by-layer closure with the use of small suture material and small instruments. In these days of antibiotics, wounds may be left open as long as 24 hours and primary surgical reconstruction then carried out.

Abrasions are treated by thorough cleansing and the removal of any pigmented foreign material that may leave a permanent disfigurement. Hematoma formation should be prevented in contusions by the application of pressure dressings. Lacerations should be meticulously reapproximated. Small avulsions may be excised and closed primarily; large areas should be covered with a graft or a rotation flap. The treatment of eyelid injury is aimed primarily at the prevention of scar ectropion and exposure of the eyeball. Débridement should be kept at a minimum.

Conjunctival tears may be repaired with the finest sutures. If the conjunctiva is avulsed, it should be replaced with mucous membrane from the mouth. Injuries to the ear should be closed by soft tissue approximation only. Sutures through cartilage are unnecessary. When Stensen's duct is lacerated it should be repaired, if possible, by primary anastomosis over a strut. If the facial nerve is divided, careful anastomosis of the severed ends gives the best possibility of restoration of facial function.

—Ely Elliott Lazarus, M.D.

Monstrous Deformities of the Hands Caused by Burns (Mains de brulés monstrueuses). F. LAGROT and N. PY. *Rev. chir. orthop.*, Par., 1954, 40: 201.

SCARS resulting from extensive burns of the hands cause either dorsiflexion or palmar flexion, with various clinical aspects of deformities. The morphologic changes are attributable to three factors, viz., retraction, contraction, and coalescence.

Four types of deformities resulting from severe burns may be distinguished: (1) palmar form which may be termed "capped hand" because the flexed hand is enveloped in a cutaneous sac, (2) dorsal form in which the hand rests on the forearm, (3) radial

form in which mainly the thumb is involved, and (4) mixed form which is a combination of the first two types and represents the most serious lesion because partial carbonization of fingers aggravates the condition. As a rule, monstrous deformities are sequelae of burns sustained either by children or by epileptic individuals. On the basis of experience with 24 scar-producing monstrosities of the hands, the authors come to the following conclusions:

Although complete mobility and satisfactory cosmetic effects rarely can be achieved, the therapy should aim at obtaining good functional results.

Palmar forms offer greater difficulties to reconstruction than other types. Nevertheless, in a 15 year old girl with bilateral palmar deformities the author succeeded in restoration of function to such an extent that the patient was able to sew.

Dorsal and radial scars are usually not associated with carbonization of phalanges, and yield more easily to reconstructive surgical procedures.

Restoration of function does not immediately follow anatomic reconstruction and requires early institution of prolonged reeducation.

Among various plastic procedures, the authors resort frequently to free dermoepidermal grafts. Perfect hemostasis is essential for success. Resection of the wrist bones or those of the forearm may be required to avoid undue tension on blood vessels. Skeletal changes found in children with extensive burns of the hands are due not to arrest in development but simply to lack of space which interferes with the growth of bones. —*Joseph K. Narat, M.D.*

Effect of Cortisone on the Healing of Localized Burns in the Hamster Cheek Pouch. MAURICE H. SHULMAN, GEORGE P. FULTON, AND GEORGE P. MORONT. *N. England J. M.*, 1954, 251: 257.

A METHOD is described for the production and standardization of localized, uniform thermal burns in the cheek pouch of the hamster (mesocricetus auratus).

Thirty normal hamsters were burned by this method, and the vascular responses in the burned area were observed and photographed daily. Healing began within 96 hours and was complete in 80 per cent of the animals after 148 hours. No scarring or infection was noted.

Burns were produced in 18 hamsters receiving daily subcutaneous injections of 5, 10, and 15 mgm. of cortisone acetate in groups of 6. In all cortisone-treated animals healing was delayed, and infection occurred as early as 45 hours in 18 per cent. Five to 13 days after burning, the pouches remained avascular, with considerable vasoconstriction, infection, and little if any healing of the wound.

A series of 12 normal hamsters were adrenalectomized 24 hours before standardized burns were produced in the cheek pouch. In this group healing progressed satisfactorily until death occurred.

—*Ely Elliott Lazarus, M.D.*

Treatment of Severe Burns with Pancreatic Enzyme (Zur Pankreasfermentbehandlung schwerer Verbrennungen). K. STUCKE. *Chirurg*, 1954, 25: 289.

THE AUTHOR, of the Surgical Department of the University of Würzburg, Germany, discusses the treatment of severe burns with locally applied pancreatic enzyme. In the second part of the article the influence of burns on the blood picture in animal experiments is reported.

The pancreatic enzyme is applied in the form of gauze bandages impregnated with a mass containing 2½ per cent of the enzyme. In this concentration the normal skin surrounding the burn is not irritated, but it is sufficient to digest and eliminate the necrotic tissue in a short time. Before application the bandages are briefly immersed in sterile water. The dressing is then covered with gauze and wax paper, and is changed every 24 to 36 hours.

With this method the removal of necrotic tissue and the onset of granulation is considerably speeded up, and the time necessary for epithelization is markedly shortened as compared with other methods of treatment. Between the sixth to the ninth days the wounds have become free of necrotic matter, and 1 or 2 days later fresh granulations and beginning epithelization from the periphery are observed. At this time skin transplantations are indicated to prevent secondary infections and consecutive scar formations which later may impede free movement of the extremities. The skin grafts take much better after the enzyme treatment than after any other manner of treatment.

These good results were confirmed by experiments on dogs. After severe scalding in general anesthesia the animals treated with enzyme dressings were free of necrotic tissue after 8 days, and epithelization began after an average of 11 days. The corresponding figures in the control animals, in which only sterile dressings were applied, were 14 and 17 days respectively.

In these animals the blood picture was followed up for 6 weeks after the scalding. The graphs show that the changes in the blood picture (decrease of erythrocytes, leucocytosis, eosinopenia) returned to normal in a shorter time under enzyme treatment than under sterile dressings. —*Werner M. Solmitz, M.D.*

Nasal Carriage of Staphylococcus Aureus in the General Population and Its Relationship to Hospitalization and to Penicillin Therapy. PHYLLIS M. ROUNTREE, BARBARA M. FREEMAN, and R. G. H. BARBOUR. *Med. J. Australia*, 1954, 2: 457.

AN INCREASED INCIDENCE of penicillin resistant pathogenic staphylococci isolated from hospital patients has been noted during the past 6 years. Less information is available as to the incidence in the general community. The anterior nares are probably the reservoir of Staphylococcus aureus, and, if so, the nasal carrier rate should be a reliable index of the incidence of antibiotic-resistant staphylococci in any given ample of a population.

A survey was made in March and April, 1954 of the nasal carrier rates of Staphylococcus aureus in a series of 200 blood donors in Sydney, Australia. The nasal carrier rate was 49 per cent. Of these carriers, 13.4 per cent were carrying penicillin resistant strains an increase of 6 per cent over the incidence found in similar studies in 1951. There appeared to be an association between nasal carriage of resistant strains and a past history of penicillin therapy or hospitalization.

Investigation of the nasal flora of 153 hospital patients showed that 17.6 per cent had acquired new strains of staphylococci in their noses by the time they left the hospital.

The authors estimate that penicillin therapy would still be effective in 6 of 7 people presenting themselves to general practitioners for treatment of acute staphylococcal infection. However, since the trend toward increasing resistance is apparent, they reemphasize warnings against the overzealous use of antibiotics. —*S. Lloyd Teitelman, M.D.*

Treatment of Wounds Inflicted by Rabid Animals. Howard J. Shaughnessy and Joseph Zichis. *Bull. World Health Org.*, 1954, 10: 805.

Dissatisfaction with the present treatment of wounds inflicted by rabid animals prompted the present authors to reinvestigate local treatment. The application of fuming nitric acid to a wound is painful, locally destructive, detrimental to healing, and promotes bacterial infection. The earlier investigators did not produce wounds which simulated a bite and did not institute treatment until 24 hours after the wound had been produced.

In the present experimental report local injury was simulated by the production of an incisional wound 12 mm. long and 6 mm. deep in the posterior neck muscles of the guinea-pig. Immediately after the wound was made, 2 ml. of a virus suspension (LD_{50} of 10^{-6} by intracerebral injection—0.5 ml. of 1 per cent suspension was required to infect guinea-pigs) was deposited and worked into the wound with the tip of a blunt 18-gauge needle.

In an earlier series, before the technique of production of injury was perfected, 27 to 38 per cent of the controls escaped infection, whereas in the later group only 2 to 3 per cent of the control animals survived. The earlier series compared the effectiveness of the local application of fuming nitric acid applied by a glass rod, against irrigation of the wound with 60 ml. to 120 ml. of a 20 per cent soap solution, and against the local application of tincture of iodine on cotton swabs. In this group, 20 per cent soap solution irrigation was found to be as effective as fuming nitric acid in 3 groups of animals in which treatment was delayed 30 minutes, 2 hours, and 6 hours. In each instance, with delay of treatment there was a decrease in the number of survivals. In another group, the local application of aqueous merthiolate 1–1000, tincture of merthiolate 1–1000, aqueous metaphen, 1 per cent silver nitrate, and tincture of iodine were compared. None of these agents produced any appreciable increment in the number of survivals. In the later series, comparisons were made between varying concentrations of aqueous zephiran solution, 20 per cent soap solution, and fuming nitric acid, all of these substances being applied by swab or glass rod into the wound. (Irrigation with 20 per cent soap solution was not employed). The comparative results are shown in Table I.

Table II shows the comparative effectiveness of concentrations of zephiran, when applied 30 minutes after contamination of the wound with the rabies virus and 2 hours after the wound contamination occurred.

One per cent zephiran solution is less corrosive than 4 per cent zephiran solution and equally as effective.

TABLE I.

	Zephiran aqueous (4%)	*20 Per cent soap solution*	*Fuming nitric acid*	*Controls*
Survivals..... (per cent)	92.5	53.7	77.6	3.0
	(62/67)	(36/67)	(52/67)	(2/67)

TABLE II.

Zephiran (%)	*30 Min. delay Survivors (%)*	*Controls*	*2 Hour delay Survivors*	*Controls*
4.0	92.5	—	91.0	—
2.5	90.8	—	76.5	—
1.0	88.7	—	89.3	—
0.1	29.1	3.6	21.9	2.4

Therefore, 1 per cent zephiran applied locally in wounds produced by rabid animals is considered as the treatment of choice of wounds artificially contaminated by the rabies virus. Further results of the study indicate that the local therapy of the wound with fuming nitric acid or soap solution was effective in reducing the incidence of fatal rabies infection in laboratory animals. This treatment became less effective as the interval following contamination of the wound with rabies virus increased. The local application of fuming nitric acid caused severe chemical burn, delayed healing and produced scarring in about 90 per cent of the animals; whereas the wounds treated with zephiran healed in approximately 2 weeks without scarring. Since the local application did not completely prevent the incidence of rabies infection, it is emphasized that people bitten by a presumably rabid animal should also receive other approved prophylactics such as antirabies vaccine or serum, or both. —*Jerry A. Stirman, M.D.*

Can Man Be Protected Against Rabies. K. F. Meyer. *Bull. World Health Org.*, 1954, 10: 845.

Critical reappraisal of the diverse methods of postinfectional vaccination has recently pointed out that the traditional strong belief in the efficacy of these treatments is based only on some general assumptions obtained from a few controlled series. Postinfectional antirabies treatment does help to prevent the development of rabies in man, but a critical comparison of passive immunization with active immunization as well as the combination of these must be carried out. The factors in the acquisition of an immunity effective against rabies in the bitten individual must be more clearly understood.

Knowledge of the means of spread of rabies is necessary for the understanding of appropriate measures of preventive medicine. Two epidemiologic types of rabies are to be recognized: (1) the disease in the natural reservoir in wild animals, and (2) the disease in the world-wide domestic animal reservoir. In most instances the initial or the immediate transferring agent of rabies to man is the domestic dog. The author points out the many problems relative to the control of rabies in animals, and that the four major factors which would bring about the success of this type of treatment would be: (1) education of the public; (2) quarantine of animals; (3) regulation of the dog population; and (4) mass immunization of the dog population.

The author reviews the various means of the production of the immune state in dogs. The efficacy of this treatment both with reference to transmission of the disease in various localities throughout the entire world and the efficacy of production of the immune state in any given animal is reviewed. He indicates that the urgency of this problem requires local, national, and international understanding and planning. The control of the endemic reservoir of rabies is a much more difficult means of control of the disease and would consist in the elimination of various reservoirs of the disease by trapping, poisoning, and hunting both in and around the centers of infection. Neither this method nor nature's way of eliminating the disease by allowing it to progress through the various vectors and produce either immunization or death has been adequately evaluated. However, neither are satisfactory without the supplementary support of preventive vaccination.

The answer to the question whether man can be protected against rabies may be answered in the affirmative provided that there is mass dog vaccination by a safe vaccine of high immunogenic efficacy and a prolonged durable immunity. The preliminary results with this type of treatment are most encouraging. However, until world-wide educational programs are instituted to protect the life and the welfare of the dog lover, rabies cannot be eliminated in man.

—*Jerry A. Stirman, M.D.*

ANESTHESIA

Controlled Hypothermia in General Surgery (L'ipotermia controllata in chirurgia generale). M. De Gregori, R. De Martini, A. Malcontenti, and L. Vallega. *Rass. ital. chir. med.*, 1954, 3: 373.

The authors enthusiastically endorse the use of controlled hypothermy (hibernation anesthesia) in general surgery. They proceed to describe the method, indications, anatomy, and physiology involved in corporal cooling, and the function and usefulness of combining ganglioplegic substances with controlled hypothermy. They further present brief case summaries of 20 major surgical cases in which controlled hypothermy was used with uniformly brilliant results.

Autonomic blocking agents are employed to enhance the effectiveness of controlled hypothermy and to prevent noxious reflexes and undesirable side effects.

The combined use of ganglioplegics and hypothermy results in the reduction of cellular metabolism to almost any desired level, the lowering of oxygen consumption, and the production of a state of anesthesia.

The method used in controlled hypothermy is given in detail. Essentially a barbiturate and antihistamine are given the evening before surgery, which dose is repeated 3 hours before the onset of surgery the following day. A prescribed pattern of drug administration follows, both preoperatively and during surgery, which includes intravenous administration of mixtures of dolosil (an analgesic spasmolytic), vitamin B_1, antistine, and esonium. The mixture is administered to the patient in 1 c.c. doses until a state of semiconsciousness is obtained, following which controlled hypothermy is induced by the application of icebags to the groin, axillae, carotids, and operative site. During the entire procedure the vital signs are carefully observed and if any irregularity in pulse, blood pressure, and respiration occurs, it is indicative of incomplete ganglionic blockade. Rectal temperatures descend to an average of 34 degrees C. by the time surgery starts, at which time the icebags are removed.

During the surgery, the patients are calm, relaxation is adequate, and there is a lessened tendency toward bleeding. The blood pressure, pulse, and respiration decrease and are maintained and stabilized at this lower level by the administration of the "mixture."

Twenty major operative cases, for all types of surgery (gastric resection, cholecystectomy, abdominoperineal operations), in which the patients were unselected and included adults up to 70 years of age, are briefly reported with uniformly excellent results. The particular effectiveness of the procedure for surgery in toxic goiter is stressed.

Postoperatively the hypometabolic state lasts from 6 to 10 hours, and the recovery of the patient is smooth and without complications.

—*Frank O. Franco, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Roentgenologic Delineation of the Organs and of Tumors of the Posterior Mediastinum (Zur roentgenologischen Darstellung von Organen und Tumoren des hinteren Mediastinum). E. ZIERHUT. *Fortsch. Roentgenstrahl.*, 1954, 80: 591.

FOUR INSTANCES of tumor of the posterior mediastinum are reported. These represent only a few of the extensive personal observations of the author and were selected to illustrate the possibilities in the study of the posterior mediastinum by pneumoretroperitoneum as originally proposed by Ruiz Rivas (*Am. J. Roentg.*, 1950, 64: 723).

The first patient was a 33 year old woman, without symptoms, whose mediastinal disease was detected in a casual manner. The clinical examination failed to disclose any evidence of pulmonary disease or of tumor of the mediastinum. The retroperitoneal injection of 1,600 cm. of air, accompanied by tomography, uncovered (at the depth of 6 cm.) the soft tissue shadow (weichteildichter Schatten) of a tumor mass protruding to the left paravertebrally, sharply demarcated and nodular, the location of which was shown by the plane of the tomogram to be in the posterior mediastinum. The lateral tomogram confirmed the anteroposterior findings. Surgery was resorted to with removal of a neurinoma arising from the sympathetic trunk.

The second patient was a 60 year old man with what was alleged to be an esophageal carcinoma in the middle third of the organ. The normal roentgenogram showed merely a defect of the esophageal lumen, however, with air-filling from the abdominal retroperoneal tissues; the tomogram in lateral projection and at a depth of 10 cm. outlined the tumor clearly. With the same technique, following combined radium-roentgenologic treatment, the tumor shadow had completely disappeared.

The third patient was a 53 year old man with what was alleged to be an esophageal carcinoma of the lower third of the esophagus. Here again the retroperitoneal injection of 1,700 cm. of air produced (on lateral tomography), a total outline of the tumor shadow. Operation (transthoracic resection) uncovered a histological horny flat-celled carcinoma.

The fourth patient was a 46 year old woman with dysphagia of a month's duration and occasional attacks of vomiting. The exploratory film disclosed only an elevation of the diaphragm on the right side with what appeared to be posttuberculous adhesions and calcifications. Air-filling and tomography in anteroposterior and lateral projections permitted distinguishing the outlines of a tumor in the posterior mediastinum with displacement of the lower portion of esophagus toward the left. However, the mucosal pattern of the esophagus was normal. In the meantime an enlarged gland in the supraclavicular fossa furnished a histologic diagnosis of carcinoma, partially solid and partially folliculoid in structure. Gynceological examination furnished the diagnosis, which was metastasis from an ovarian carcinoma.

—*John W. Brennan, M.D.*

Contributions of Mammary Roentgenography to Certain Problems of Breast Cancer Surgery (Contribution fournie par la radiographie mammaire à certaines problèmes de la chirurgie du cancer du sein). JEAN KUNTZMANN and CHARLES-MARIE GROS. *J. chir.*, Par., 1954, 70: 481.

FOUR CASES are presented in which breast roentgenography demonstrated cancer which was not clinically obvious. In 2 cases widespread metastases were present after a radical mastectomy, and only the roentgenograms showed the presence of a small cancerous focus in the remaining breast which escaped clinical detection despite repeated, careful examinations. The authors are therefore performing routine roentgenographic examinations in the remaining breast after mastectomies.

It is also suggested that roentgenography might offer a valuable guide to the surgical approach in clinically detected tumors in which malignancy is not established. In the absence of roentgenographic signs of malignant disease, limited excisional biopsy might be carried out, whereas in suspected cases a wide excision, subtotal mastectomy, or even a total mastectomy might be performed. Moreover, in poor risk patients the roentgenographic demonstration that a lesion is small and early might make a more limited procedure advisable.

Clinical and histologic examinations are of first importance in the management of this lesion and roentgenography should never become more than an adjuvant procedure. —*Jonas Brachfeld, M.D.*

The Conventional Roentgenogram in the Commonest Congenital Malformations of the Heart and Great Vessels in Adults and Juveniles. GEORG-FREDRIK SALTZMAN. *Acta radiol.*, Stockh., 1954, supp. 114.

THESE CASES of congenital malformation of the heart and great vessels were seen at the First Roentgen Department in collaboration with the Heart Clinic at Södersjukhuset, Stockholm, Sweden. All cases were verified either by special procedures or at autopsy. Certain malformations of infancy which are incompatible with life were not included because the material was limited to adults and juveniles.

The author bases his conclusions on the roentgen signs obtained from conventional posteroanterior and lateral films (and fluoroscopy), plus the presence or absence of cyanosis on physical exertion. Oblique views were rarely used since the author found that it was very difficult to estimate the size of a particular ventricle when the ventricular portion of the heart was enlarged as the result of congenital heart malformations. The author also rejects the use of the terms "aortic knob," "aortic or pulmonary window," and others, on the basis of their being unanatomical as well as a source of confusion and misunderstanding.

Seven malformations have been discussed, with the aid of one to several roentgenograms of each condition (reproductions in the fluoroscopic image).

The cyanotic group includes (1) tetralogy of Fallot, (2) Eisenmenger's complex, and (3) valvular pulmonary stenosis, with atrial septal defect (trilogy of Fallot). Isolated valvular pulmonary stenosis with no shunt and no cyanosis was included at this point.

In the acyanotic group (4) atrial septal defect, (5) ventricular septal defect, and (6) patent ductus arteriosus were included. Coarctation of the aorta (7), having no shunt, concludes the presentation.

The so-called classical signs are reviewed and reevaluated in the light of recent publications.

The present monograph will be especially appreciated by radiologists and cardiologists in institutions lacking the more refined and more complicated methods of cardiac evaluation. A generous bibliography is included. —*R. Burns Lewis, M.D.*

Portal Venography in Banti's Disease. G. H. DuBoulay AND B. GREEN. *Brit. J. Radiol.*, 1954, 27: 423.

PORTAL venography was used at surgery in the study of 46 cases of portal hypertension. The procedure consisted of the injection of a 35 to 70 per cent iodine dye into a tributary of the portal vein (usually a jejunal vein) or directly into the splenic pulp. Two films were taken within an interval of 2 seconds.

In this manner extrahepatic blocks resulting from portal vein thrombosis, from extrinsic pressure on the portal vein, or from the various congenital malformations were demonstrated. Intrahepatic blocks from cirrhosis of the liver were also shown.

The procedure is of value to the surgeon in that veins suitable for caval or renal vein anastomosis are demonstrated.

Incidental findings in the series of cases were the demonstration of gastric varices without esophageal varices; portal hypertension and stasis without obstruction to the portal system; and the streamlining or separation of blood in the portal vein into a stream from the superior mesenteric vein, and another from the splenic veins.

In all cases of splenic puncture, 50 to 200 c.c. of blood leaked from the puncture wound. This factor, plus the occasional rupture of the splenic capsule from hemorrhage, is advanced against the percutaneous splenic injection of dye. —*John J. Gaughan, M.D.*

Pneumoretroperitoneum in the Study of Renal Malformations (Il pneumoretroperitoneo nello studio delle malformazioni renali). D. GANDINI and A. GIBBA. *Radiol. med.*, Milano, 1954, 40: 417.

METHODS BY WHICH the urologic diagnosis may be completed with pneumoretroperitoneum, with or without an associated planigraphic examination, are discussed. Other methods of urologic diagnosis are, of course, not neglected; however, in the belief that the method here described has superseded pneumorenal and pneumoperitoneum, these two methods of examination are not here examined. The ideas expressed are illustrated by a series of roentgenographic reproductions in the original article

One set of figures illustrates a right and a left renal hypoplasia. In these the pneumoretroperitoneum brought out the decreased diameters of the anteroposterior profiles of the kidney parenchyma, and the planigraphic reproductions showed the diminished anteroposterior thickness of the organ.

Another set of figures illustrates the findings with urographic, pneumoretroperitoneal and, finally, with pneumoretroperitoneal and planigraphic examinations of a right sacral supernumerary kidney and a cyst of the inferior pole of the normally placed organ.

One set of figures illustrates how the discussed methods of examination may be used in the diagnosis of supernumerary kidneys, in this case excluding a true duplex kidney by demonstrating the fusion of the kidney portions bearing the duplex renal pelvis.

One set of figures illustrates the instance of a young woman with a double vagina and urinary incontinence existing since infancy. It was suspected that there was a supranumerary ureter opening into one of the vaginas; however, such communication could not be located. Here the methods employed (pneumoretroperitoneum; planigraphy) demonstrated a small extra kidney perched on the upper pole of the left kidney. Exposure of the left kidney permitted successful removal of the true duplex kidney which cured the urinary incontinence instantly.

One set of figures illustrates the findings in a horseshoe kidney with triplication of the kidney pelvis (3 excretory outlets).

Another set of figures illustrates the findings in ectopia cruciata dextra after retrograde bilateral pyelography and on pneumoretroperitoneal and planigraphic examinations.

The last set of figures illustrates the findings in ectopia lumboiliaca dextra.

These findings are intended to show why the authors are induced to place special emphasis on the value of pneumoretroperitoneum as they believe it is the best means so far devised for demonstrating the parenchyma of the kidney, and also its use in association with planigraphy, as well as the ordinary urologic methods of examination in the selection of the proper technique in the treatment of renal malformations. —*John W. Brennan, M.D.*

RADIUM

The Treatment of Plastic Induration of the Penis (Peyronie's Disease). OLOV DAHL. *Acta radiol.*, Stockh., 1954, 41: 290.

THE AUTHOR deals with the nonsurgical treatment of Peyronie's disease, including surface radium application, roentgen therapy, and administration of vitamin E, as practiced at Radiumhemmet, Stockholm, Sweden, since 1940. His purpose is to evaluate the relative merit of these three methods.

The administration of vitamin E is of more recent origin and was started only in 1949 on a basis of clinical trial. Eighteen patients were treated with this drug. Two types of preparations were used in equal ratio: (a) the mixed tocopherols in the form of "E-vimin forte," supplied by the AB Astra, Södertälje, Sweden, and (b) the synthetic alpha-tocopherol in the form of "ephynal forte," supplied by Hoffman-La-Roche AB, Stockholm, Sweden. The former was dis-

pensed in capsules, containing concentrated wheat germ oil with a vitamin E equivalent corresponding to the biologic action of 50 mgm. d1-alpha-tocopherol, and the latter in tablets containing 50 mgm. d1-alpha-tocopherol acetate. The author's series has shown no demonstrable superiority of either preparation. A dose of 300 mgm. was administered by mouth daily for at least 6 months. The longest duration of treatment was 17 months and the average, 9 months.

To facilitate uniform evaluation of the results obtained, the author devised a system of grading of the severity of the symptoms and clinical signs. Thus he distinguished between (1) penile curvature, (2) pain on erection, (3) disturbance of coitus, and (4) size of penile plaques, by classifying each as (a) not present, (b) moderate, (c) marked, and (d) severe. The effect was marked down as (a) disappearance, (b) marked decrease, (c) moderate decrease, (d) no change, and (e) increase. A statistical compilation of the final results with vitamin E therapy revealed "pronounced improvement" in 4 patients, "moderate improvement" in 6 patients, and a "poor result" in 8 patients. Five patients showed a subjective improvement of the general condition, both physical and mental, in conjunction with the treatment.

The radiation treatment of Peyronie's disease at Radiumhemmet was carried out in the earlier days mostly with teleradium therapy. The procedure referred to by the author in the present article was instituted in 1940, on the initiative of Strandquist. It consists in the use of surface radium application in the relatively superficial and circumscribed lesions and of roentgen therapy in the more extensive lesions involving the deeper layers or the perineal parts of the corpora cavernosa.

The technique of the radium application is briefly as follows: tubes containing 8 mgm. radium each and placed in glass capsules are fixed parallel to each other and applied in two rows in "roof-truss" fashion over the lesion, the number of tubes depending on the size and shape of the induration. The dose is taken as the average of that from the surface to a depth of 1 cm. Empirically, it was found that 1,100 gamma roentgens constitutes an adequate "average dose." Treatment may be repeated after 6 months, but with an "average dose" of only 600 gamma roentgens or less.

The factors of the roentgen therapy are: 170 kv.; 0.5 mm. copper and 1 mm. aluminum filtration, corresponding to a half-value layer of 0.9 mm. copper; a focus skin distance of 40 cm.; 15 ma.; 85 r/min.; and a 20 sq. cm. field. The usual skin dose (with back scatter included) is 1,200 roentgens from one direction, or 750 roentgens from each of two opposite directions, in each case divided over a period of 3 days. A similar dose may be given after an interval of 3 months.

The series of patients with Peyronie's disease seen at Radiumhemmet from 1940 to 1951 includes 188 cases. Of these, 96 are analyzed in the present article as to the final results obtained. Seventy-nine patients were treated by radium application, although some also had supplementary roentgen therapy, and 17 patients were treated by roentgen therapy alone Of the entire group, 19 patients showed "pronounced improvement," 34 "moderate improvement," and 43 a "poor result."

In a supplementary note, the author states that he also used vitamin E therapy in 22 nonselected cases of Dupuytren's contracture, a disease often coexisting with Peyronie's disease and apparently related to it. The results obtained were disappointing and therefore he believes that further use of this drug as a sole therapeutic agent is not recommendable.

—*T. Leucutia, M D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Hypothermia; a Technique of Blood Stream Cooling. D. N. Ross. *Guy's Hosp. Rep.*, Lond., 1954, 103: 97.

IN THE PRESENT experimental study on dogs, a different method for the application of hypothermia was employed. Hypothermia reduces the metabolism and oxygen requirements to levels at which the circulatory flow may be interrupted for varying intervals. These intervals have been too brief for much intra-cardiac instrumentation.

A brief historical review is given of various applications of hypothermia. For the most part, reduction in temperature is obtained by surface cooling with ice or specially designed blankets. The organism is cooled by cooling the blood in an extracorporeal circuit. The animals are cooled to 25 degrees C. There is a detailed description of the apparatus, which consists essentially of a heat exchanger through which the blood flows, and a refrigerating unit. The heat exchanger is so constructed that it can be autoclaved. The animals are premedicated with morphine and atropine. Anesthesia is induced with pentothal, and an endotracheal tube is introduced. The femoral vessels are cannulated and connected with the heat exchanger. Subsequently the temperature falls 1 degree every 5 minutes, taking nearly 1 hour to reach 25 degrees C. Upon discontinuance of the cooling the temperature may fluctuate moderately.

One of the advantages of this type of cooling is that the end point is more clearly defined than with surface cooling. At 23 degrees, cardiac irregularities are frequent. The pulse decreases from 180 pulsations per minute to 60 per minute at 25 degrees C. Respirations at 28 degrees are barely noticeable. Assisted pulmonary ventilation is necessary to prevent respiratory acidosis. Re-warming is best accomplished with a light cover at room temperature.

Seventy dogs were subjected to an operative procedure. In 15, thoracotomy with clamping of the great veins was done. Ventricular and atrial cardiotomy was done in several groups. Clamping of the great vessels across the transverse sinus was also accomplished. The venous return could be clamped for 5 to 7 minutes before serious cardiac irregularities ensued, viz., ventricular fibrillation. Air embolism regularly occurred if a septal defect was produced. To counter both of the above hazards, an intra-arterial transfusion from femoral vein to femoral artery was done, which prevented embolism by keeping the aortic valve closed, and also perfused the coronaries. Working periods of 15 to 20 minutes were allowed.

Following cardiotomy the cardiac chambers were usually filled with blood or saline to exclude air. When air was allowed to remain it could be seen to embolize to the coronary circulation. This embolism could be countered by cutting a branch of the coronary and allowing the air to escape.

—Richard L. Lawton, M.D.

Anticoagulants. CATHERINE C. BURT. *Edinburgh M. J.*, 1954, 61: 273.

TODAY there are two major types of anticoagulants in use. One of these is heparin, which acts directly on the clotting mechanism as an antithrombin, antithromboplastin, and probably as an antiprothrombin. Within a few minutes after its injection the clotting time of the blood is prolonged. Because heparin is rapidly excreted by the kidneys, the clotting time quickly returns to normal. The other type of anticoagulant is the antiprothrombin agent exemplified by dicumarol and tromexan which act by inhibiting the formation of one of the clotting factors. The effect of such agents is not noticed for several days after the treatment has been initiated.

Intermittent intravenous administration of the heparin appears to be the safest method. Intramuscular injection of the drug results in a slower absorption. Although heparin is a nontoxic substance, idiosyncrasy does occur. Symptoms consist of dyspnea, chest discomfort, flushing, and tachycardia. They are transient and apparently can be eliminated by intramuscular administration rather than intravenously.

The action of the heparin already circulating in the patient's blood can be terminated promptly by the intravenous administration of a 1 per cent solution of protamine sulfate in doses of 1 to 5 c.c., or by toluidine blue. In contrast to this, the effect of dicumarol or tromexan cannot be so easily counteracted. Blood transfusion is the only effective way of restoring normal clotting function. In instances of severe overdosage transfusion may have to be repeated for several days. It should be noted that heparin does have an effect on the prothrombin time so that when a patient is under both heparin and dicumarol treatment there may be a large error in the prothrombin time estimation. In such instances the true estimate of the dicumarol influence can be made by first adding protamine sulfate before determining the prothrombin time.

There are several complications in both types of anticoagulant treatment. With heparin there may be marked bruising about the sites of injection, both intravenous and intramuscular. There may be also hemorrhage from the bowel. With dicumarol, the commonest complication is hematuria but there may be widespread subcutaneous and petechial hemorrhages.

Anticoagulants are indicated in cases of arterial or venous thrombosis, in which the effort is directed at preventing or minimizing consecutive thrombosis and embolic episodes. It has been found possible to use tromexan in outpatients for long periods. In the author's series of 200 cases of venous thrombosis, pulmonary emboli occurred during treatment in 10 patients, with 1 fatality. This incidence was considerably lower than in untreated cases reported by Zilliacus (1946) whose series gave a 30 per cent figure with a mortality of 9.3 per cent.

—Benjamin F. Lounsbury, M.D.

Fat Embolism; the Detection of Fat Emboli in the Circulating Blood. LEONARD F. PELTIER. *Surgery*, 1954, 36: 198.

FAT EMBOLISM is a riddle wrapped in a mystery inside an enigma. Fat embolism has resisted the efforts of surgeons to define it as a clinical entity, and there are some who, even now, deny that such a diagnosis can be made on clinical grounds alone.

The author reported on a method for detecting fat emboli in the circulating blood. This method depends upon the concentration of the emboli by centrifugation and their visualization by fluorescence microscopy after staining with a water-soluble fluorochrome, phosphin 3R.

Previous investigations have visualized embolic fat in the blood of dogs and patients. This method has been tested in experimental animals with fresh fractures. In each animal in which fractures of the long bones were produced, fat emboli could be found in the peripheral blood. This observation was substantiated in every animal by the detection of fat emboli in sections of tissue removed at autopsy. The presence of alimentary lipemia did not appear to interfere with the application of the method.

In a group of 78 patients undergoing various orthopedic procedures, fat emboli were found in 43. There was a good correlation between the magnitude of the bony injury and the presence of embolic fat. Fat emboli were commonly detected following major reconstructive operations upon bone. The frequency of this finding in the absence of clinical signs attributable to fat embolism provokes the speculation that a traumatic lipemia is a normal sequel to bony injury and becomes of pathologic significance only when associated with other factors as yet largely unrecognized or understood. —*Robert Turell, M.D.*

Histogenesis and Classification of Mesonephric Tumors of the Female and Male Genital System and Relationship to Benign So-Called Adenomatoid Tumors (Mesotheliomas); a Comparative Histological Study. GUNNAR TEILUM. *Acta path. microb. scand.*, 1954.

THE AUTHOR REPORTS 19 cases of tumors of the male and female gonadal systems. He attempts to point out evidence of a histogenetic relationship existing between tumors of different localization and appearance, but all arising from homologous mesonephric elements. Fourteen cases fall into the class of mesonephric tumors of the female. This group includes a group of clear-celled or hypernephroid type tumors and a group possessing many tubules or vacuoles. These tumors were situated in the broad ligament, ovary, vaginal wall, or cervix.

Two cases of tumors of the male epididymis and spermatic cord are presented. These showed a cystic papillary carcinoma and in some areas resembled the clear-cell type of female tumor. The author believes that the differentiation from primordium may proceed toward the formation of tubules with an epithelial lining as well as toward the formation of epitheloid strands, either compact or vacuolated.

Three cases of benign "mesotheliomas" of the genital tract are also presented, and the findings in these tumors are strikingly similar to those in the malignant tumors. This has led to the suggestion that these also may arise from mesonephric elements.

—*C. Barber Mueller, M.D.*

Treatment of Malignomas with an Extract of Wound Granulations—WGH (Ein Beitrag zur Malignombehandlung mit Wundgranulationsextrakt, WGH). A. KRESSNER. *Muench. med. Wschr.*, 1954, 96: 855.

HAMMERSCHMID demonstrated activation of connective tissue in the vicinity of wounds by an extract from granulations. In this manner the extract accelerated the process of wound healing.

It occurred to the author that such extract might promote encapsulation of tumors and thus inhibit their growth.

In one patient with carcinoma of the vocal cords with pulmonary metastases, a series of injections of the extract was followed by a temporary regression of the primary tumor and amelioration of pain. In another patient with squamous cell carcinoma of the larynx the granulations disappeared after 12 injections and no recurrence could be detected 9 months later. In a patient with reticulosarcoma of the mastoid, with involvement of the brain tissue, the tumor could not be completely removed. After a series of injections a shrinkage of the tumor was followed by healing of the wound, and 6 months later the patient was in perfect health.

The author attributes the beneficial effect of the extract to stimulation of reparative processes in the connective tissue and to a reaction of the endocrine and the reticuloendothelial systems.

—*Joseph K. Narat, M.D.*

Malignant Melanoma; Review of 63 Patients. DOUGLAS H. RIDDELL AND BARTON MCSWAIN. *Am. Surgeon*, 1954, 20: 827.

ALTHOUGH the primary tumor of malignant melanoma occurs on the skin in 90 per cent of the cases, where it is easily accessible to inspection and examination as well as early treatment, the recorded 5-year survival rate is low. Much of the blame for this poor showing can be placed on inadequate initial treatment. This tumor should not be confused with a benign pigmented mole which is also a melanin-bearing lesion. Both the benign and malignant tumors contain pigment, although in some instances they may appear clinically nonpigmented.

If the tumor is ulcerated the chances are that it is malignant. Forty-four per cent of the 63 melanomas in this series showed ulceration. In 20 instances an erroneous diagnosis was made; in the other 43 patients the clinical diagnosis was established. In 23 patients the lesions were so far advanced that no operation was undertaken, or only a simple biopsy was done. The authors believe that roentgen therapy is ineffective and they have discontinued its use. They emphasize that cauterization and fulguration of skin tumors should not be done in any instance in which the tumor might either be a benign pigmented mole or a malignant melanoma. Such treatment is particularly bad since it destroys the tissue on which the diagnosis might be made.

Analysis of the present series indicates that 5 years is not an adequate length of time for determination of

cure, since 2 patients had recurrences 6½ years and 8 years, respectively, after operation.

In the authors' series of cases, adequate initial treatment of malignant melanoma gave a 30 per cent chance of 5-year survival.

—*Benjamin F. Lounsbury, M.D.*

Sarcomas of the Muscles and Accessory Tissues of the Trunk and the Extremities (Sarcomi dell'apparato muscolare ed accessorio del tronco e degli arti; considerazioni statistiche e risultati lontani). BALLARATI UMBERTO. *Tumori*, Milano, 1954, 40: 257.

THE PRESENT report is a statistical analysis of 42 cases of sarcoma of the muscles and fascia. During the period from 1922 to 1952, a total of 3,600 cases of malignant tumors were observed. In this group there were 207 sarcomas and, of these, 42 were of the muscle tissue. There were 19 males and 23 females in the series. The age incidence ranged from 9 years to 80 years of age, with a mean age of 41 years. The initial symptom in 36 patients was the presence of a tumor mass, which was the reason for admission to the hospital in all 42 cases.

The majority of these tumors occurred in the inferior extremities (27 cases); the tumefaction in 16 of these patients was limited to the thigh. Pathologically, the tumor was a single nodule of variable size, limited externally by a capsule, but infiltrating the underlying muscle tissue. The tumors are firm and adherent to the deeper tissues, and only rarely are they painful. In this series, histologic examination revealed there were 23 immature sarcomas composed of pleomorphic malignant cells, and 13 blastomatous sarcomas of the muscle, or of fibrous or fatty tissue.

The most significant factor in the history is the presence of a painless tumefaction in the soft tissues of the body, especially in the lower extremities. The treatment employed in these cases consisted of local resection, radical resection, amputation, and roentgen therapy.

With regard to treatment, the most favorable prognosis was seen in the cases of those patients who were subjected to radical surgical resection. Among 28 patients so treated, 13 were alive and well after a period of 5 years. The mortality rate was higher in cases of immature sarcomas than in blastomatous sarcomas. Thirteen cases in the series showed signs of metastatic involvement. In the presence of lymph nodes, and visceral or bony metastasis, any method of treatment is followed by a poor prognosis.

On the basis of this analysis, the author is of the opinion that all soft tissue tumefactions, especially of the extremities, should be resected surgically to determine their exact nature, this to be followed by more radical treatment when indicated by histopathologic study.

—*Roland A. Manfredi, M.D.*

Preservation and Transplantation of Human Tissues. CHARLES ROB. *Lancet*, Lond., 1954, 2: 255.

ADVANCES made in the transplantation of tissues, and the potentialities for future enlargement of such procedures are discussed in this interesting article. In the sense that a graft is a transplant of tissue which forms a permanent living union with the host, one can only conclude that no successful homologous graft has yet been achieved with the possible exception of the identical twins and grafts to the cornea.

Autogenous transplants can be made to take and survive permanently as true grafts. Homologous grafts, on the other hand, die completely or in great part within varying periods from the time of their being placed. In the instance of skin grafts they serve a useful purpose as a dressing for a large raw area. In the instance of arterial grafts the surviving elastic fibers make the homologous graft a useful bridge in the arterial defect, even though the intima dies and is not replaced. No successful transplant of a hollow viscus has yet been reported. In a few instances transplanted organs have functioned, insufficiently at best, and then died within a few months. Autogenous skin makes a convenient tissue for closing many defects in hollow viscera, as in cervical esophagus, urethra, and trachea. Endocrine glands are more likely to succeed when transplanted in the face of a deficiency of the hormone of that gland. One instance is cited in which an ectopic thyroid was transplanted to the abdominal wall with proved survival of the gland.

Tissues may be stored in several ways. Cell survival can be expected for a period of up to 8 weeks after storage at 0 to —4 degrees C. in nutrient medium. A better method is to store in glycerol saline at —79 degrees C. or lower, when long survival is possible. When cell survival is unnecessary, storage may be in the frozen state or by freeze-drying; both allow almost permanent preservation but freeze-drying is the more convenient.

—*Benjamin F. Lounsbury, M.D.*

ACTH and Cortisone in Surgery (ACTH und Cortison in der Chirurgie). JOERG REHN. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 278: 229.

THE AUTHOR, of the Surgical Department of the University of Freiburg i.B., Germany, reviews the indications and contraindications to the use of ACTH and cortisone in surgery, and reports 11 cases from his own observation.

He distinguishes between general and local beneficial action. The hormone treatment has an antitoxic, analgesic, and euphorizing effect. It is indicated especially in the following conditions: peritonitis (for the prevention of adhesions?), marked surgical shock, the preoperative treatment of very sick patients (ACTH), crush syndrome, and the preoperative treatment of splenectomy in thrombocytopenic purpura. Locally, good results have been reported in the treatment of bursitis, myositis and arthroses, and in conditions following joint surgery, fasciectomy in Dupuytren's disease, and plastic surgery of the ureter and urethra.

Contraindications include: active tuberculosis, severe cardiovascular disturbances, gastrointestinal ulcers, and prepsychotic conditions. In all infectious conditions, great caution should be observed. The general resistance against the growth and spread of bacteria is lowered, and rapid spread of the infection may occur without any clinical symptoms. In the presence of infections, or danger of infection (burns), hormones should be used (if at all) only under cover of antibiotics in high dosage. In cases of fractures, neither ACTH nor cortisone may be used as it pro-

longs the time of consolidation. Spontaneous fractures due to osteoporosis have been reported after prolonged hormonal treatment of rheumatoid arthritis.

The question of the relative merits of ACTH and cortisone is discussed briefly. True deficiency of adrenal cortical hormone is comparatively rare. In most cases a dysfunction of the hypophysis and the midbrain centers is present; therefore ACTH is preferable to cortisone. Only in Addison's disease and after surgery of the adrenal glands is cortisone in combination with desoxycorticosterone the treatment of choice.

In 3 cases of peritonitis observed by the writer, the hormone treatment had obviously a life-saving effect. In one of these cases the peritonitis followed tears of the small intestine in an accident; in the other 2 cases it followed rupture of the uterus and paralytic ileus. Postoperatively these patients were in desperate condition; however, ACTH, given by drop infusion, brought about a spectacular improvement. In a fourth case of ruptured uterus with consecutive peritonitis and paralytic ileus the initial success of intravenous ACTH was also excellent, but on the eighth postoperative day the patient died of hemorrhage from a previously existing peptic ulcer which apparently had been reactivated by the hormone therapy.

In patients with inoperable tumors or severe toxic damage of other etiology, an unsatisfactory postoperative course is often markedly improved by ACTH or cortisone.

The connections between ACTH, cortisone, and the clotting mechanism of the blood are not as yet clear. Danger of thrombosis or embolism has been reported in the literature, especially after abrupt discontinuation of hormone treatment. The author did not personally observe such cases but states that close observation of prothrombin and clotting time is imperative during hormone treatment.

—*Werner M. Solmitz, M.D.*

Extended Use of Diced Cartilage Grafts. LYNDON A. PEER. *Plastic & Reconstr. Surg.*, 1954, 14: 178.

IT APPEARS that diced cartilage grafts may have a much wider field of application than was originally supposed. Introduced first by the author to fill skull depressions and defects about the face, it was later extended to be used in the reconstruction of ears. By filling a perforated ear mold with diced cartilage and burying the mold in the subcutaneous tissue of the abdomen for about 5 months, the separate segments become bound together by fibrotic tissue, forming a solid structure representing the shape of the mold.

Diced cartilage has recently been used by George Simms in 30 cases, to reinforce recurrent inguinal and ventral hernial closures. Similarly, it has been used by the mold method to form a cartilagenous cup instead of a vitallium cup for mobilization of an ankylosed hip, by John Flanagan, and this has now been weight-supporting without complications for 18 months. Another application, as performed by Henry Brodkin, is to build in ribs to protect the heart in patients who have had extensive removal of ribs. Diced cartilage is used to fill tantalum mesh fashioned in the shape of ribs. He has also used it to fill in the depression which still remains after his funnel chest operation in children. In collaboration with Robert Green, of South Orange, and Richard Swain, of Newark, diced cartilage has been used for filling large bony defects in children with spina bifida, in conjunction with a single large horizontal bipedicle flap which is lowered to cover the defect.

The method of introducing cartilage grafts in this fashion to fill cavities and prevent herniation, and the formation of molds and of new ribs are all based on a physiological fact or law. Connective tissue abhors unlined dead spaces as nature abhors a vacuum. Fibroblasts and their accompanying blood vessels grow into the numerous dead spaces between the individual diced cartilage segments, and fill them with collagenous fibers and cement substance. These substances, when dry, after about 5 months, provide a strong binding material which holds the individual segments firmly together.

Autogenous tissues as free grafts are always better than those of another individual. However, when the patient's own cartilage cannot be obtained in sufficient quantity, cadaver cartilage may be used and is usually well tolerated by human tissues.

—*Carl Schiller, M.D.*